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Mercury and Air Pollution

a bibliography with abstracts

Environmental Protection Agency

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MERCURY AND AIR POLLUTION:

A BIBLIOGRAPHY WITH ABSTRACTS

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CONTENTS

INTRODUCTION v

ANNOTATED BIBLIOGRAPHY

A. Emission Sources 1

B. Control Methods. 6

C. Measurement Methods 9

D. Air Quality Measurements 19

E. Atmospheric Interaction 22

F. Basic Science and Technology 24

G. Effects - Human Health 26

H. Effects - Plants and Livestock 40

I. Effects - Materials (None)

J. Effects - Economic (None)

K. Standards and Criteria 44

L. Legal and Administrative. 46

M. Social Aspects 48

N. General (None)

AUTHOR INDEX 49

SUBJECT INDEX. 51

MERCURY AND AIR POLLUTION: A BIBLIOGRAPHY WITH ABSTRACTS

INTRODUCTION

The Air Pollution Technical Information Center (APTIC) of the Office of Air Programs has selected and compiled this bibliography of abstracts on mercury and air pollution. The abstracted documents are thought to be representative of available literature, and no claim is made to all-inclusiveness.

The abstracts are arranged within the categories listed in the Contents. Within each category, they are arranged in ascending order by APTIC accession number. Generally, higher numbers, representing later accessions, have been assigned to more recent documents. Subject and author indexes refer to the abstracts by category letter and accession number. The author index lists all authors individually. Primary authorship is indicated by an asterisk (*).

All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Readers outside the Environmental Protection Agency may seek duplicates of the documents directly from libraries, publishers, or authors.

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A. EMISSION SOURCES

06351

R. F. Abernathy and F. H. Gibson

RARE ELEMENTS IN COAL. (Bureau of Mines, Washington, D.C.) (Information Circular 8163). (1963). 73 pp.

Data are presented showing trends in the content of chlorine, phosphorus, titanium, and manganese although these elements are not included in the category of rare and uncommon elements in coal. It is suggested that elements may be called rare when the amount in the earth's crust is not much greater than 0.01 percent. By uncommon is meant unusual concentrations of elements greater than normally occur in the mineral matter of coal. The occurrence of 34 elements in coal is reviewed. These do not include the elements silicon, aluminum, iron, calcium, magnesium, sodium, potassium, and sulfur, which constitute the main part of the mineral matter in most coals. Some of the rare elements found in coal probably were derived from the original coal-forming plant material. Elements occuring in sufficient concentration to be detected as minerals usually are considered as extraneous substances deposited in coal beds from external sources. Three main stages of the enrichment of elements in coal are suggested: (1) Concentration during the life of the plants; (2) concentration during decay of the plants; and (3) concentration during mineralization of the coal. There are three hundred eighty (380) references.

06909

I. M. Trakhtenberg K. I. Luchina

'MERCURY DANGER' AND ITS PREVENTION IN SECONDARY SCHOOLS. ('Rtutnaya opasnost'' i ee profilaktika v usloviyakh obshcheobrazovatel'nykh shkol.) Hyg. Sanit. (Gigiena i Sanit.) 30 (12), 411-4 (Dec. 1965) Russ. (Tr.)

The potential dangers and means of preventing micromercurialism in secondary schools were discussed. In the last 10 years, health workers in different cities have reported facts indicating the potential danger of micromercurialism in standard secondary schools. Contamination with mercury vapor was detected in several physics rooms at schools as well as in the laboratories attached to them. Mercury contamination is possible also in chemistry rooms. We sampled and analyzed for mercury 626 air samples and 342 samples of different building materials taken from several schools. The principal source of air pollution with mercury in chemistry rooms was found to be the mercury vapor liberated during the demonstrations of the decomposition of mercuric oxide and of metallic mercury as an example of a liquid metal. The dissociation of HgO to metallic mercury and oxygen takes place at a high temperature, thus facilitating the intensive evaporation of mercury and the liberation of large amounts of its vapor into the air. The laboratories often keep compounds that are not on the standard lists, including mercury nitrate which liberates mercury vapor even at ordinary temperatures.

08489

Korshun, M. N

PREVENTION OF AIR POLLUTION WITH MERCURY INSIDE INDUSTRIAL PREMISES OF SYNTHETIC FIBER COMBINES. ((O preduprezhdenii zagryazneniya rtutyu vozdukha pomeshchenii kombinatov iskusstvennogo volokna.)) Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(11):18-22, Nov. 1966. 10 refs.

Mercury vapor concentrations in the chemical department of a synthetic fiber combine were determined. A source of the vapors appears to be the mercury present in the alkali which is produced by electrolysis of salt, using mercury electrodes. Factors contributing to air pollution include the high temperature of the alkali, the operating procedures, and equipment which does not comply with sanitary regulations. The chemical department of a synthetic silk industry is included in the category of plants which are deemed harmful due to the presence of mercury vapors. Health recommendations aimed at improvement of working conditions are given. (Author's summary, modified)

12422

Lutz, G. A., S. B. Gross, J. B. Boatman, P. J. Moore, R. L. Darby, W. H. Veazie, and F. A. Butrico

DESIGN OF AN OVERVIEW SYSTEM FOR EVALUATING THE PUBLIC-HEALTH HAZARDS OF CHEMICALS IN THE ENVIRONMENT. VOLUME I. TEST-CASE STUDIES. (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Contract PH-86-66-165, 146p., July 1967. 203 refs.

Potential environmental health hazards due to the utilization of mercury, nickel, vanadium, fluorocarbons, and the chemicals used by the pulp and paper industry were reviewed. Pertinent information was identified and selected by examining appropriate subject indexes of journals, abstracts, and current periodicals. The combined activities of collection and evaluation were directed specifically toward the following interpretations: current status of environmental contamination by each of the five contaminants, current status of environment-related medical knowledge of the effects of the contaminant, technological changes likely to lead to the entrance of new contaminants of the selected types, demographic-related changes that would affect the degree of population exposure to the contaminants, and deficiencies in the available information. The studies revealed potentially hazardous situations. Mercury showed a substantial increase in the amount used in the electrolytic production of chlorine. There also exists a lack of fundamental information on national levels of mercury in air, water, and food. The vanadium study showed a significantly increased usage of volatile compounds in industrial applications. The nickel study raised the question of possible chronic effects of small quantities of nickel in food from the use of large quantities of nickel equipment in food processing. A need was demonstrated for the establishment of the environmental fate of fluorocarbons used in aerosols and refrigerants. A review of information on chemical processes employed by the pulp and paper industry demonstrated the need for surveillance of the atmospheric pollutants resulting from increased use of kraft pulping operations. Economics information and the toxicity of the five contaminants were discussed in detail.

14286

Pakter, M. K., D. P. Dubrovskaya, A. V. Pershin, and G. K. Talalaev

MERCURY IN CARBONIZATION BY-PRODUCTS. Coke Chem. (USSR) (English transl.), no. 11:41-44, 1968. 7 refs.

The mercury content of various carbonization products from Soviet coke and Chemical works was checked. Mercury was present in the precipitates from tar and tar liquor, predominately in the form of sulfides. The tar contained approximately 40% of the mercuric sulfide. When the tar was rectified, about 40% of the mercury was released in metallic form. Under appropriate cooling conditions, it is liberated in the condensing apparatus. The remainder of the tar mercury contained mainly anthracene, oil, and pitch. Nearly all the mercury was distilled off when hard pitch was produced. It was established that mercury collects in significant quantities only in coal tar, in certain precipitates, and in sulfuric acid tar. (Author conclusions modified)

17624

Melekhina, V. P.

DATA RELATED TO SANITARY CLEARANCE ZONE SURROUNDING THE KLINSK THERMOMETER PLANT. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. vol. 8:184-187, 1963. (B. S. Levine, ed.) CFSTI: 63-11570

The safety of a sanitary protection zone 100 m wide around a mercury thermometer plant was investigated. Mercury vapor in the air was determined microcolorimetrically. One hundred and seventy three samples were collected with an aspirator on the lee side of the plant of 100, 250, 500, 1000, 1500, 2000, and 3000 m. All atmospheric air samples collected at points up to 2000 m from the plant contained mercury vapor in concentrations exceeding the allowable concentration limit. The high atmospheric air mercury vapor concentrations penetrated into living quarters and into the soil. The analyses pointed to a general gross environmental mercury vapor pollution caused by the mercury vapor discharged into the atmospheric air by the thermometer plant. It was concluded that the sanitary clearance zone should be widened and apparatus be installed in the plant for the purification of emissions prior to discharge into the air.

21751

Stahl, Quade R.

PRELIMINARY AIR POLLUTION SURVEY OF MERCURY AND ITS COMPOUNDS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div. Contract PH 22-68-25, NAPCA Pub. APTD 69-40, 96p., Oct. 1969. 243 refs. CFSTI: PB 188074

The effects, sources, abatement, and methods of analysis are reviewed for pollution due to mercury and its compounds. Significant sources appear to be the mining and refining of mercury and the use of mercury in industrial and scientific laboratory applications. Russian experiments with animals indicate that continuous exposure to mercury vapor above 0.3 micrograms/cu m of air may present a health hazard. Mild symptoms of mercury intoxication are psychopathological in nature and thus can present serious problems in diagnosing the cause. Recent air measurements of particulates in New York indicate that the mercury concentration of indoor samples is as high as 40 micrograms/cu m, or several times higher than that found safe in animal experiments using mercury vapor. Some organic mercury compounds, particularly the alkyl derivatives, are much more toxic than elemental mercury or the inorganic compounds. Portable continuous monitoring detectors, battery-operated vapor detectors, absorption techniques, radiochemical methods, and colorimetry are some of the approaches available to detect mercury vapor. Mercury can be removed by use of water scrubbers, a pyrolusite absorber, sweeping with special vacuum cleaners, and chemical treatment. (Author abstract modified)

23561

Morgan, George B. and Guntis Ozolins

THE IMPACT OF AIR POLLUTION ON THE ENVIRONMENT. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Air Quality and Emission Data, 12p., 1970.

The population of a large part of the world has been exposed to polluted air for many decades and, in some cases, centuries. Significant increases are forecast for the future. If control actions are not intensified, air pollution may increase by a factor of six to ten by the year 2000. Before any meaningful control efforts can be carried out, we must know what the ambient levels of pollution are and how they relate to levels established as causing health or economic effects. Many pollutants have always been a part of the natural atmosphere. They are now called pollutants because, with man's help, they are now excessive in quantity. Particulate pollution is the most recognized and pervasive. Its health effects are functions of both particle size and composition. Another significant effect is that, suspended in the atmosphere, particulates reflect away part of the sun's energy and could result in an over-all lowering of the earth's temperature. Gases, 90% of all pollutants, are the second class of pollutant. Examples are sulfur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide, and hydrogen fluoride. A third major pollutant class is the family of hydrocarbons. These participate in photochemical reactions which result in the formation of secondary pollutants such as peroxyacyl nitrates, ozone, formaldehyde, other aldehydes, and ketones. It is from these secondary pollutants that the primary danger to both animal (including the human animal) and vegetable life arises. Numerous industrial processes and the ubiquitous automobile emit these assorted products that are a serious problem in the environment surrounding their source. Almost all human activity results in some form of air pollution, direct or indirect, particulate or gaseous. High-temperature combustion, automotive, industrial, and domestic, is the principal offender. Parameters that must be considered when evaluating effects of pollution include quantity, distribution, and environmental tolerance for pollutants, individually and in concert. Locally, micrometeorology and topography also require consideration. Of all identified pollutants, suspended particulates and sulfur dioxide have been the most extensively measured and studied. As analytical techniques become available, other pollutants will come under programmed surveillance. Among these are asbestos, mercury, lead, pesticides, fluorides, and biologically active metals. International assessment of these problems is necessary for the preservation of the biosphere.

27081

McCarthy, J. H., Jr., J. L. Meuschke, W. H. Ficklin, and R. E. Learned

MERCURY IN THE ATMOSPHERE. In: Mercury in the Environment. Geological Survey, Washington, D. C., Profess. Paper 713, p. 37-39, 1970. 7 refs.

The abundance of mercury in the earth's crust is estimated to be about 60 ppb, and the abundance of mercury in soils is estimated to be about 100 pb. Mercury in the atmosphere is derived from surface rocks and solids and from continuing

hypogene and supergene processes. In general, the maximum mercury concentration is found in areas over mercury mines, lower concentrations over base and precious metal mines, and still lower concentrations over porphyry copper mines. The concentration of mercury in air over nonmineralized areas ranged from 3 to 9 ng/cu m. Mercury concentration in air as a function of altitude is shown graphically. A seasonal variation is ascribed to seasonal temperature differences, while daily variations result from changes in barometric pressure. Lesser concentrations of mercury are found in air over the ocean.

29643

Grant, Neville

MERCURY IN MAN. Environment, 13(4):2-15, May 1971. 29 refs.

Perhaps the largest quantities of mercury added to the environment by man are released with the burning of natural fuels. From available evidence it appears that U. S. coal may average between 0.5 and 3.3 ppm mercury; at present rates of coal consumption, between 275 and 1800 tons of mercury are probably being released to the air annually. The extraction and use of mercury itself is a substantial source of pollution. According to one estimate, mining, smelting, and refining operations released 170,000 pounds of mercury into the enviornment in 1965. Agricultural uses of mercury, although small compared to the total, are of concern because of their immediacy to man. Mercurial fungicides may enter the food chain in a variety of ways. Most recent concern over mercury has been focused on water pollution and the resultant contamination of fish. The conversion of inorganic mercury to organic by microorganisms has been shown. The two general classes of mercury compounds--organic and inorganic--differ greatly in the extent to which they are absorbed by the body and the degree of damage they may do, once absorbed. Methyl mercury is far more readily absorbed, and much more slowly excreted, than inorganic compounds. Mercury compounds have been shown to cause breakage and abnormal chromosome division in concentrations lower than any other known substance--as low as 0.05 ppm. The derangement of chromosomes by mercury probably depends on its interaction with sulfhydryl groups essential for normal spindle formation that directs an equal division of chromosomes into each newly formed cell. Other toxic effects of mercury are indicated as well as the behavior of mercury in the body. Levels of exposure are cited. An intake of not more than 0.03 milligram methyl mercury per day has been recommended.

29787

Eda, Shizuo, Hiroshi Ito, Hiroshi Hikichi, Sadakichi, Ejiri, Shigeo Nagayama, and Kaoru Nishiyama

INVESTIGATION OF HEAVY METAL POLLUTION IN IWAKI CITY. (Iwaki shi ni okeru jukinzoku osen chosa). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(4):317-324, April 1971. 15 refs.

There are pollution problems of sulfur dioxide, heavy metals, dust, hydrogen sulfide, cyanide, mercury, and cadmium, in the Onahama industrial area. Analyses of the soil, paddy field rice, cadmium, copper, zinc, lead, and other heavy metals. Results showed that there is typical heavy metal pollution of the air which is carried by the wind. There is no need to worry about pollution of paddy fields, upland fields, and soils by factory effluents. Cadmium pollution of the soil exceeding 1 ppm is seen in only a few spots, and is considerably lower than Bandai Town, Fukushima Prefecture. A Pollution Prevention Agreement was imposed. The enterprises must comply with smoke emission standards and environmental standards and adjust their operation in accordance with meteorological conditions.

30017

Joensuu, Oiva, I.

FOSSIL FUELS AS A SOURCE OF MERCURY POLLUTION. Science, 172(3987):1027-1028, June 4, 1971. 10 refs.

One suspected source of environmental mercury pollution is mercury-containing fungicides used in treatment of grain seeds. However, the amounts used are much too small to explain high mercury contents in wildlife. A large part of the mercury found in the environment is derived from industrially produced mercury, approximately 10,000 tons/yr, most of which is discarded in waste streams. Another possible source could be fossil fuels and ores. Although the concentration of mercury in fuels is small, they are consumed at an enormous rate and must be considered as a possibly significant source of mercury release. The amount of mercury in coal is not well known. To obtain a preliminary value, 36 American coals were analyzed by a mercury vapor detector. It was concluded that 3000 tons of mercury/yr are released to the environment by the burning of coal. The upper limit of mercury released by weathering is 230 tons/yr. Detailed studies are needed to determine the distribution of mercury near power plants and other users of coal.

30292

Goeij, J. J. M. de and J. P. W. Houtman

MERCURY IN THE ENVIRONMENT. (Kwik in het milieu). Text in Dutch. Chem. Weekblad., 67(10):13-20, March 5, 1971. 62 refs.

Studies using neutron activation analysis show the average mercury content of the lithosphere to be about 0.07 ppm. The erosion of rocks and soil containing mercury liberates about 2.5 million kg of mercury annually into the biosphere. The present mercury content of ocean water is 0.15 ppb. Total production of mercury has been estimated at about 10 million kg per year. Mercury used in thermometers and electrical equipment does not usually need replenishing. Mercury used in various chemical and metallurgical processes is partially lost to the environment, while mercury used for pesticides, batteries, paints, lubricants explosives, and fireworks is consumed beyond recovery. The literature on mercury pollution in Japan, Sweden, Canada, and the United States is reviewed, and original data are given from Dutch investigations. Certain industrial processes, such as the roasting of ores, can release mercury into the air. Some combustible materials, such as paper and textiles, contain fungicides with mercury content; it is also present in coal as a level of 0.4 ppm. Petroleum has been known to contain as much as 20 ppm and tobacco as much as 0.4 ppm. Mercury in the Toronto atmosphere was found at concentrations of 0.14 and 0.35 mg/cu m in 1962; eight years later the levels were 0.25 and 0.75. A San Francisco study revealed that the mercury content of the atmosphere is strongly dependent on meteorological conditions. When the wind blew in from the ocean, a minimum of 1 mg/cu m was recorded. With a northerly wind in winter, values reached 15 and 25 mg, while in summer, when influenced by the industrial area of San Francisco, values reached 50 mg. Especially high values of mercury have been noted in conjunction with the occurrence of smog. The pollution of food with mercury and the direction of future research in technology and biomedicine are also discussed.

30457

Ruch, R. R., Harold J. Gluskoter, and E. Joyce Kennedy

MERCURY CONTENT OF ILLINOIS COALS. Illinois State Geol. Surv., Environ. Geol. Notes, no. 43:1-15, Feb. 1971. 7 refs.

A neutron activation method with a sensitivity of 0.01 ppm and a precision of + or - 20% was used for the determination of mercury in coal. Fifty-five raw coal samples from 10 coal seams in Illinois had a mean mercury concentration of 0.18 ppm and a mode between 0.10 ppm and 0.12 ppm. Eleven coal samples from other states had mercury concentrations within the same range, or slightly lower. Three coal samples were individually separated into specific gravity fractions in the laboratory; all exhibited a mercury reduction of at least 50% in the lightest coal fraction and a concentration of mercury in the heaviest fraction. A significant part of the mercury was associated with the pyrite in the coal, and the remainder (perhaps up to 50%) was in organic association.

31313

Ullmann, William W.

HEAVY METALS IN THE CONNECTICUT ENVIRONMENT. Assoc. Food Drug Offic U. S. Quart. Bull., 35(3):147-152, July 1971. (Presented at the New England Association of Food and Drug Officials, Winter Meeting, Windsor, Conn., Feb. 4, 1971.)

Connecticut s involvement with the prevention of lead poisoning originated in the 1930 s with a program aimed at protecting occupationally exposed workers. Industrial air samples from areas where lead is used in manufacturing processes were periodically collected and analyzed, and urine and blood analyses were performed by industry on all workers who may have been exposed. Once a worker s blood lead level has reached 0.08 mg/100 cc, he is removed from the job to a function not involving lead until the level has returned to 0.07 mg/100 cc or less. Fatalities in Connecticut due to lead poisoning totaled 14 in the ten-year period from 1959 through 1968. Many more victims certainly were afflicted with non-fatal symptoms including mental retardation, damage to the central nervous system, convulsions, and anemia. As a result of the awareness of the critical problem of lead poisoning, a Governor s Task Force was commissioned in 1969 and has been active in reviewing all aspects of the hazards associated with lead-based paints and in developing recommendations to help formulate preventive programs. Lead poisoning in children and screening programs are discussed. Sources of lead and its absorption in the body are mentioned. The problem of mercury in food is also cited.

31548

Bolker, Henry I.

OUT OF THE WOODS. Tech. Rev., 73(6):22-29, April 1971.

Except for the recycled paper which yields a product for only limited and uses, and the small amount of rags converted into special fine papers, most of the pulp and paper industry s raw material comes from trees. Both the mechanical and chemical methods for rendering wood into pulp are described. The kraft process and the acid-sulfite process are cited. Rendering wood into pulp, and then bleaching and processing the pulp into a suitable base for paper, cause the most serious waste problems in the papermaking process. One of the greatest errors of the paper industry was to use organo-mercury slimicdes in its mills to stop the growth of slimy molds on paper machines. The problems with fibers are also mentioned, but every new mill is now being equipped with facilities to remove solid and other wastes before water is returned to the land. Older mills are also acquiring suitable facilities--mainly in the form of large settling tanks where the water can be clarified and secondary aeration systems. Waste materials in true solution constitute a different problem. After separation of the pulp fibers, the spent liquor from a sulfite cook contains lignosulfonic acid, degraded carbohydrate polymers, and free sugars, as well as some residual bisulfite.

33004

Rancitelli, L. A.

INORGANIC EMISSIONS FROM THE HANFORD STEAM PLANT. In: Pacific Northwest Laboratory Annual Report for 1970 to the USAEC Division of Biology and Medicine. Vol. II: Physical Sciences. Part 2. Radiological Sciences. Battelle Memorial Inst., Richland, Wash., Environmental and Life Sciences Div., p. 37-38, March 1971. NTIS: BNWL-1551, Part 2

An effort was made to establish the inorganic emissions of a Hanford steam plant by characterizing the trace element content of coal and ash. Neutron activation analysis of 12 elements in samples of coal and ash indicated that the chromium, iron, sodium, and rubidium are conserved, while mercury, antimony, selenium, and scandium are depleted in the ash, relative to the coal. Based on a 20,000 tons/yr consumption rate and a dry ash production of 1200 tons/yr, approximately 2.9 lbs of mercury, 2.9 lbs of selenium, and 2.6 lbs of arsenic are emitted by the plant annually. An extrapolation of these values to the annual consumption rate of coal in the U. S. suggests that 30 tons of arsenic and mercury and over 300 tons of selenium/yr will be placed in the atmosphere by coal burning.

33058

West, J. M.

MERCURY. Preprint, Bureau of Mines, San Francisco, Calif., 11p., 1970. 21 refs.

The domestic production, consumption and uses, prices, foreign trade, and a world review of mercury were presented. In the field of technology, progress was made in geochemical exploration techniques for mercury deposits and for the trace mercury associated with base-metal deposits. Precision of mercury analyses with the atomic absorption spectrophotometer had a lower limit of detection of 0.05 micrograms. Using a one gram sample, a content as low as 50 ppb was detectable. A U. S. Geological Survey report was released describing a new technique of detecting the presence of mercury in vapors either in the soil or in the atmosphere above a deposit. Mercury content of 12 ppb was detectable in airborne tests.

33641

Eshleman, Alan, Sanford M. Siegel, and Barbara Z. Siegel

IS MERCURY FROM HAWAIIAN VOLCANOES A NATURAL SOURCE OF POLLUTION? Nature (London), 233(5320):471-472, Oct. 15, 1971. 7 refs.

Field air samples were collected and analyzed to determine whether active volcanism on the island of Hawaii is producing significant amounts of mercury. A Utopia Instruments flameless mercury analysis kit and a 10 cm absorption cell mounted on the burner of a Beckman 1301 atomic absorption spectrophotometer were used to analyze the mercury contents of the trapped sample. Significant amounts of mercury were produced from volcanoes, with 98% of the mercury issuing from the Hawaiian fumaroles either in the form of a gas or as particles less then 0.3 micrometer in diameter.

34424

Weiss, Herbert V., Minoru Koide, and Edward D. Goldberg

MERCURY IN A GREENLAND ICE SHEET: EVIDENCE OF RECENT INPUT BY MAN. Science, 174(4010):692-694, Nov. 1971. 11 refs.

Neutron activation analysis of glacial ice from Greenland revealed significantly higher rates of mercury deposition in recent years. Samples from waters deposited prior to 1952 had from 30 to 75 ng mercury/kg of water with an average value of 60 + or - 17. The mercury concentration in waters deposited between 1952 and 1965 averaged 125 + or - 52 ng/kg of water with a range between 87 and 230. The background concentration of mercury in the atmosphere appears to result from the degassing of the terrestrial upper mantle and lower crust. Increased fluxes of mercury to the atmosphere may be the result of human activities that enhance the degassing process by increasing the exposure of crustal materials. Industrial activities that release significant quantities of mercury to the atmosphere are chloralkali production, fossil-fuel combustion, cement production, and the roasting of sulfide ores.

34754

Stock, Alfred and Friedrich Cucuel

THE OCCURRENCE OF MERCURY. (Die Verbreitung des Quecksilbers). Text in German. Naturwissenschaften (Berlin), vol, 22:390-393, 1934. 9 refs.

The mercury trace content of many inorganic and organic substances was determined by highly sensitive analytical methods. In most cases mercury was isolated by heating pulverized material in a porcelain tube to 800 C for several hours and by condensing the mercury vapors in a U-shaped absorption bulb. The mercury was dissolved in chlorinated water and electrolytically precipitated on copper wire. From materials which yield interferring distillates, mercury was solubilized by a potassium chlorate-hydrochloric acid solution. The trace quantities of mercury found in some of the tested materials were: rocks (granite, syenite), 2.1 gamma; slate, 48 gamma; humus soil, 3-81 gamma; fossil coal, 0.8-2.2 gamma; spring water, 0.01-0.05 gamma; rain water, 0.05-0.48 gamma; lettuce, 0.9 gamma; dried beans, 4.6 gamma; pork, 0.6 gamma; calf s liver, 2 gamma; and fish, 2.4-19 gamma. Humans ingest approximately 5 gamma Hg every day in meals. Thus traces of mercury are ubiguitous, approximately in the order of magnitude of 0.00000001 g which is due to its great volatility which sets mercury from other metals. It is possible that mercury plays a biological role and that, like iron, it is one of the catalytic elements.

34827

Wallace, Robin A., William Fulkerson, Wilbur D. Shults, and William S. Lyon

MERCURY IN THE ENVIRONMENT. THE HUMAN ELEMENT. Oak Ridge National Lab., Tenn., National Science Foundation Interagency Agreement AAA-R-4-79, 61p., March 1971. 281 refs. NTIS: ORNL-NSF-EP-1

Numerous aspects of environmental mercury are reviewed including: flow of Hg in the U. S. during 1968; man-made and natural sources; environmental and biological levels; forms and transformation of Hg in the environment; turnover, translocation, and accumulation in plants and animals; criteria for evaluating Hg levels, including human toxicity; existing standards and tolerance limits in air, water, and food; physical and chemical properties; analytical methodology; the mercury cell chlor-alkali process; and recommendations for future work. The most important man-made sources of environmental Hg in the U. S. are chlor-alkali plants, seed-dressing agents, smelting operations, and fossil fuel combustion; the principal natural sources are the land mass itself and geothermal processes. The social implications of current use practices must be more intensively considered, and improved recycling and industrial technology must be developed.

B. CONTROL METHODS

06837

D. Lee

REMOVAL OF REACTIVE LIGHT GASES WITH IMPREGNATED ACTIVATED CHARCOAL. Preprint. (Presented at the Fourth Annual Technical Meeting and Exhibit, American Association for Contamination Control, Miami Beach, Fla., May 25-28, 1965.)

Straight activated charcoal is the most-nearly universal adsorbent known and for 95 percent of all air contaminants, it does an excellent job. On those light reactive gases for which activated charcoal does not have too much capacity, impregnated charcoals can be used to good effect. A series of such charcoals has been developed wherein each member is impregnated with one or more substances and is particularly designed to have high capacity for the specific air contaminant. Because of the high cost of impregnated charcoal, it may be desirable to use in conjunction with activated charcoal. Impregnated charcoal has been very sucessful in air purification to protect electronic equipment from sulfur and in removal of mercury vapor, ammonia, and acid gases missed by alkaline scrubbers.

06883

Petrova, N. I., and Zh. I. Pokrovenko

METHODS OF REDUCING AIR POLLUTION DUE TO WASTE PRODUCTS FROM NIKITOVKA MERCURY WORKS. ((K voprosu ob umen'shenii zagryazeniya vozdukha vybrosami Nikitovskogo rtutnogo zavoda.)) Hyg. Sanit. (Gigiena i Sanit.), 30(1):74-77, Jan. 1965. Translated from Russian. CFSTI: TT 66-51033

The pollution of air by mercury vapor depends on the total quantity of the furnace gases; trapping the mercury vapor in condensation systems; hermetic sealing of the equipment and of the gas flues; and special purification of gases before their discharge into the atmosphere. The most efficient method of preventing the pollution of the atmosphere by mercury vapor is by improving technological processes in the plant. For example, since the quantity of exhaust gas increases if the ore has a higher moisture content, it is important to keep this moisture content within the technical specifications for plants operating tubular and retort furnaces. The most complete condensation of mercury vapor reduces the amount of vapor in the exhaust gases to 50% and less. Such condensation is achieved by improving the performance of the condensation systems and by spraying the gas with water in scrubbers, or in the final compartment of the condensers. The furnace gases were purified by spraying with water in the retort furnace shop and by the use of the pyrolusite and selective chlorine-gas methods in the tubular furnace shop. Gases from the retort furnaces containing between 30 and 120 mg/cu m mercury pass through two packed scrubbers sprayed with process water before being discharged into the atmosphere. The concentration of mercury vapor is reduced by nearly 80% on the average.

06884

Krupitskaya, I. D., and I. L. Pisarevskii

AN INCIDENCE OF MERCURY VAPOR CONTAMINATION OF RESIDENTIAL BLOCKS. ((Sluchai zagryaznenia parami rtuti zhilykh kvartir.)) Hyg. Sanit. (Gigiena i Sanit.), 30(1):81-83, Jan. 1965. Translated from Russian. CFSTI: TT 66-51033

In view of the possibility of the poisonous effect of mercury, the preparation of amalgam in dentist's offices is authorized only in an exhaust hood with the fan turned on. Three such hoods were installed in the new dental clinic in Chelyabinsk. The ducts in the exhaust system leading from them were made out of asbesto-cement ductwork and ran through builtin closets in the apartments on the floors above the clinic. When the clinic was being accepted for operation, the sanitary-epidemiological station demanded the submittal of documents pertaining to the concealed work, with an indication that the exhaust ventilation had been executed according to the design. A year after the dental clinic had begun to operate, the sanitary-epidemiological station received complaints from the tenants in three stairwells in the building that medical smells were entering their apartments. After determination of the existence of mercury in the areas intended for human habitation, the sanitary-epidemiological station immediately prohibited the clinic from filling teeth with copper amalgam. Simultaneously the decontamination of the mercury in the apartments began. This process was carried out with an acidulous solution of potassium permangante. At the request of the sanitary-epidemiological station, a commission was created, which established that the air seal of the exhaust ducts had been broken as a result of the settling of the building and by the fact that the asbestos-cement ducts had broken in a number of places where they fitted into the ceilings. Repeated tests on the apartments for the existence of mercury in them after the carrying out of all these measures yielded negative results.

28918

Neal, Paul A., Robert H. Flinn, Thomas I. Edwards, Warren H. Reinhaut, J. Walter Hough, J. M. Dallavalle, Frederick H. Goldman, David W. Armstrong, Albert S. Gray, Allan L. Coleman, and B. F. Postman

MERCURIALISM AND ITS CONTROL IN THE FELT-HAT INDUSTRY. Public Health Bull., no. 263, 132p., 1941. 57 refs.

Fifty-nine cases of chronic mercurialism were found on medical examination of 534 hatters employed in five representative felt hat factories. Four of the twenty-one men engaged in mixing and blowing; 8 of the 34 coners; 6 of the 29 hardeners, and 33 of the 179 starters, wetters-down, and sizers were so diagnosed. Mixers and blowers were exposed to 5 mg Hg per 10 cu m of air; hardeners to 2.7; and starters, wetters-down, and sizers to 2.1 mg Hg per 10 cu m of air. In any range of exposure above 1.0 mg Hg per 100 cu m the incidence of mercurialism increased with increasing duration of employment. No cases were found among hatters exposed to less than 1.0 mg Hg per cu m of air, as measured by the Nordlander instrument. Chronic mercurialism is characterized by fine, intention

tremor; psychic irritability of an exaggerated degree; dermographia, excessive perspiration, and abnormal readiness to blush; exaggerated tendon reflexes; pallor; and certain abnormalities of the mouth. Mercurialism cases were found to excrete slightly less mercury in their urine than similarly exposed but nonaffected workers. Workers with elevated systolic blood pressure and albuminuria tended to excrete less mercury in their urine than similarly exposed workers who were normal in these respects. The most direct means of preventing the occurrence of mercurialism among hatters is to substitute a nontoxic carroting agent for mercury. Until this is practicable, control of the mercury hazard depends on coordinated general and local exhaust ventilation so arranged and maintained as to prevent the escape of mercury into the breathing zone of workers, and upon enclosure or segregation of fur storage rooms, blowers, driers, and other sources of volatile mercury. Sketches of hoods and other enclosures, and specifications for air flow are presented. Methods for quantitative chemical analysis of the mercury content of air, fur, tank water, etc., and for the quantitative spectrographic analysis of mercury in urine are described in detail. (Author abstract)

29328

Rastas, J., E. Nyholm, and J. Kangas

MERCURY RECOVERY FROM SO2-RICH SMELTER GASES. Eng. Mining J., 172(4):123-124, April 1971. 1 ref.

When Outokumpu Oy put on-stream its zinc plant at Kokkola, Finland, about half of the mercury contained in the zinc concentrate went to the sulfuric acid produced, and Outokumpu had to find a method for mercury removal from roaster gases. If roasted in a fluidized bed furnace at 950 C, the mercury sulfide contained in zinc concentrates decomposes and the mercury vaporizes. The heat contained in the gases is recovered in a waste-heat boiler. Dust is separated from the gas with cyclones and electrostatic precipitators, and the gases at a temperature of 350 C go to the sulfatizing unit. The mercury sulfatizer is a brick-lined tower containing ceramic packing; here, the mercury-bearing gases are contacted by a countercurrent flow of strong sulfuric acid which sulfatizes the mercury. Sulfuric acid flows from the bottom of the tower to an intermediate storage tank, from where it is pumped through a heat exchanger and recycled to the tower. Part of the acid is taken from the storage tank to a thickener, where mercury sulfate and selenium compounds are separated from the solution. Zinc and iron salts formed from the dust of the gas are also separated from the acid in the thickener. Gas leaving the mercury sulfatizer at a temperature of 180 C contains less than 0.2 mg/cu Nm of elemental mercury. The gas is then washed with weak sulfuric acid in a venturi scrubber to decrease the temperature to about 70 C and to lower the chlorine content to a level permitted for sulfuric acid production. The underflow which is obtained when the mercury and selenium compounds are separated from this weak acid in the thickener is combined with the underflow of the thickener of the mercury sulfatizer. Precipitates from the combined underflow are washed with water. The filtered residue is mixed with lime in a certain proportion, and the batch charged to a resistance-heated furnace whose temperature is raised gradually to about 650 C. The mercury compounds decompose, and metallic mercury vaporized is carried out of the furnace together with an air stream.

29450

Kanbara, Shu

HIGH POLYMER WASTE DISPOSAL AND TECHNICAL RENOVATION. (Kobunshi haikibutsu shori to gijutsu kakushin). Text in Japanese. Preprint, Japan Society for High Polymers, Tokyo, 8p., 1971. 8 refs. (Presented at the Symposium of High Polymer Disintegration, 2nd, Tokyo, Japan, April 14-16, 1971, paper 4.)

The relationships between raw materials and production, consumption and values, and products and by-products are critically reviewed to establish the basic guidelines for an industrial waste disposal system. The desulfurization of heavy oils and the procedsing of the iron ores from mainland and China will occur at the place of production. New manufacturing process are mentioned in the processing of high quality lubricants without using sulfuric acid; the development of inexpensive and effective polymerization preventive agents other than sulfur used in refining styrene monomer; the synthesis of e-caprolactam with less ammonium sulfate byproduct; the development of a new catalyst for polypropylene polymerization with less attacktic (?) production; the separation of oil droplets of less than 100 ppm in waste water by polypropylene or polyurethane; and the removal of the minute mercury content of water by polyethylene glycol. Research on collection, shredding, and disintegration by light or microorganisms are explained and the improvement of the energy efficiency in chemical manufacturing processes is emphasized. In mechanical manufacturing process, such as rolling the development of new lubricants is desired. An example of the new types of combined industry which utilize each other s by-products is the use of sodium sulfite from the sulfur dioxide of a thermal power plant in pulp manufacturing. Iron oxides and SO2 are being recovered by burning the iron sulfate from a titanium white factory and sulfuric acid pitch from a lubricant factory. A global look is taken on the waste disposal problem.

30117

Flewelling, F. J.

LOSS OF MERCURY FROM CHLORALKALI PLANTS. Chem. in Can., 23(5):14, May 1971. (Presented at the Royal Society of Canada, Symposium on Mercury in Man s Environment, Montreal, Quebec, Feb. 1971.)

Approximately 60% of the chlorine and caustic soda manufactured in Canada is produced by the mercury cell process, the remainder by a diaphragm cell process in which mercury is not involved. Starting in 1970, the mercury cell plants undertook extensive modification to reduce mercury losses in products, in solid wastes, to the atmosphere, and to sewers. Typical abatement methods are reviewed, and the extent to which they reduce losses indicated. The methods include filtration, sulfide precipitation, cooling of hydrogen, mist elimination, and restricted use of water. The mercury emission limit per ton of chlorine produced is 0.005 lb/ton, effective Sept. 1, 1971.

31390

Zemskov, I. F. and A. S. Stepanov

MECHANISM OF INTERACTION OF ORGANOMETALLIC COMPOUNDS ON THE SURFACE OF ACTIVATED CARBON. J. Appl. Chem. (USSR) (English translation from Russian of: Zh. Prikl. Khim.), 43(1):185-188, Jan. 1970. 6 refs.

Organometallic vapors in air-gas mixtures were adsorbed on activated carbon and studied for the nature of their surface interactions. The vapors were tetraethyl lead (TEL), diethylmercury (DEM), tetraethyl tin (TET), and ethylmercuric chloride (EMC). Tetraethyl lead and TET interacted with oxygen of the gaseous mixtures on the activated carbon surface. Adsorbed TEL AND TET underwent mineralization. Treatment of carbon saturated with TEL vapors with oxidants such as chlorine or ozone accelerated mineralization of the adsorbed TEL.

Mineralization of TEL increased the activity of activated carbon with respect to TEL vapor. Diethylmercury and EMC vapors did not interact with oxygen on the carbon surface to any appreciable extent. When the vapors were adsorbed in the presence of ozone, the adsorbate content of the carbon increased only in the case of TEL. This was due to the ease with which TEL is oxidized. (Author conclusions modified)

32461

Kangas, J., E. Nyholm, and J. Rastas

SMELTER GASES YIELD MERCURY. Chem. Eng., 78(20):55-57, Sept. 6, 1971.

A technique was developed which scrubs the sulfur dioxide-rich gases from smelter or roasting operations of mercury before the gas is processed for sulfuric acid production. At the Kokkola plant of Outokumpu Oy (Finland), zinc concentrates are roasted in a fluidized-bed furnace at at temperature of 950 C. Mercury sulfide contained in the concentrate decomposes completely and mercury vaporizes. The heat contained in the gases is recovered in a waste heat boiler, and dust is separated from the gas by means of cyclones and electrostatic precipitators. Mercury-containing gases coming from the electrostatic precipitators at a temperature of 350 C go to the sulfatizing unit. The mercury sulfatizer is a brick-lined tower containing ceramic packing, in which mercury-bearing gases contact a countercurrent flow of strong sulfuric acid. Mercury and selenium are scrubbed from the gas by the acid. Sulfuric acid flows from the bottom of the tower to an intermediate storage tank, it is then pumped through a heat exchanger and recycled to the tower. Zinc and iron salts, as well as chlorides and fluorides, can also be removed in this process. Washing the precipitate, and the production of metallic mercury are mentioned.

34795

Porter, D. H. and J. D. Watts

ECONOMIC ASPECTS OF CONVERTING A CHLOR-ALKALI PLANT FROM MERCURY CELLS TO DIAPHRAGM CELLS. Preprint, American Inst. of Chemical Engineers, New York, 15p., 1971. (Presented at the American Institute of Chemical Engineers, National Meeting, 68th, Houston, Tex., Feb. 28-March 4, 1971.)

In 1969 the U. S. electrolytic chlorine-alkali industry purchased over 20,000 flasks of mercury, or over 25% of the total U. S. consumption to become the largest single purchaser. This industry does not consume mercury to form a product. Following the initial charge, for which another several thousand flasks were purchased in 1969, all mercury entering a plant is used to replace losses -- losses to the sewer, losses in sludges, losses in ventilation air, and losses to product in the form of contaminants. In March 1970, the Chlorine Institute formed an ad-hoc committee to concern itself with the subject and set up several task forces to examine the many phases of the problem. Threshold Limit Values, control programs, and estimated costs are considered. Conversion to diaphragm cells is recommended to eliminate possibilities of mercury pollution. Differences are discussed between the mercury cell and diaphragm cell plants. These pertain to the cell house, rectifiers and amperage, chlorine temperatures and cooling equipment, hydrogen temperatures and recovery, the brine system, caustic handling and waste handling or effluent treatment. Costs are considered.

C. MEASUREMENT METHODS

05191

A. R. Barringer

DEVELOPMENTS TOWARDS THE REMOTE SENSING OF VAPOURS AS AN AIRBORNE AND SPACE EXPLORATION TOOL . Proc. Symp. Remote Sensing Environ., 3rd, Ann Arbor, Mich., 1964. pp. 279-92. Feb. 1965

The remote sensing of geochemical parameters is investigated. The techniques under study and development are concerned with sensing the dispersion of volatile components of orebodies or their oxidation products in the surface soils and in the air above. The elements and compounds of interest include mercury, iodine and sulphur dioxide in connection with metal bearing deposits, and hydrocarbon gases and iodine in association with oil fields. (Author abstract)

05977

Browett, E. V.

ANALYTICAL METHODS. Ann. Occupational Hyg. (London) 8, (1) 21-8, Mar. 1965. (Presented at the 16th Conference, British Occupational Hygiene Society, Apr. 7-8, 1964.)

Techniques of performing 'spot' tests for the presence of metallic or metal-containing contaminants in atmospheres are reviewed briefly. The procedures for more accurate determination of the concentration of atmospheric contaminants and for the determination of the metal content of blood and of urine are treated as comprising three steps: collection, pre-treatment and analysis. Methods for the collection and pre-treatment of various amples are are described. Colorimetric and polarographic methods of analysis Methods for the collection and pre-treatment of various samples of prepared sample solutions are discussed with particular refer- ence to the determination of trace amounts of lead and attention is drawn to various precautions that must be taken in order to obtain reliable results. (Author abstract)

06045

D. L. Adamson, J. D. Stephens, and W. M. Tuddenham

APPLICATION OF MINERALOGICAL PRINCIPLES AND INFRARED SPECTRA IN DEVELOPMENT OF SPECTROGRAPHIC TECHNIQUES. Anal. Chem. 39(6):574-578, May 1967. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, March 5, 1965.)

Correlation of infrared spectra of spectrographic arc residue beads with emission data revealed that samples yielding beads containing olivine and pyroxene group minerals evolved volatile elements in the arc most rapidly and produced the highest elemental line intensities for the volatile elements and the lowest intensities for iron. The hypothesis was developed that combination of iron with silca to form linked ionic groups within the melt decreased iron evolution. The resulting increase in arc temperature intensified excitation of the volatile elements. Exclusion of extraneous ions from these ionic groups also appeared to be a factor in the acclerated evolution of volatile elements. Methods were developed for determination of volatile elements--antimony, arsenic, bismuth, cadmium, gallium, germanium, indium, lead, mercury, tellurium, thallium, and zinc--in a wide variety of materials, including iron oxides, limonite, magnetite, pyrite, chalcopyrite, manganite, silca, and silicate minerals in general. (Authors' abstract)

07284

Khrustaleva, V. A. and N. G. Shalya

MERCURY POLLUTION OF INDUSTRIAL PREMISES IN WORK INVOLVING MERCURIC CHLORIDE. Text in Russian. Gigiena i Sanit. Vol. 9, p. 22-25, 1950. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dist., Vol. 2, p. 4-7, March 1960. CFSTI TT60-21188

An investigation was made into the source of mercury in the atmosphere inside a dry cell plant. The method of HgCl2 absorption by a NaCl solution was used in making separate determinations of the simultaneous presence of mercuric chloride and of mercury fumes. Mercury was determined colorimetrically. The results indicated that air pollution in the shops was caused almost entirely by Hg fumes and that the concentration of the HgCl2 fumes was negligible. High concentrations of both substances were found in scrapings from the walls and floor. At this point it became certain that mercury was the source of pollution of the working area; attempts were then made to establish the cause of HgCl2 reduction to Hg. The reducing action of the individual ingredients of the electrolyte and of the flour thickener was also investigated. Since calcium chloride, ammonium chloride and zinc chloride did not reduce mercuric chloride, it was assumed that metallic zinc, as an impurity of the zinc chloride, might have been responsible for imparting this property to the electrolyte. However, results of the analyses did not substantiate this assumption. An attempt was then made to determine mercury in the final electrolyte which contained the flour thickener. Mercury was found in amounts of 0.099 - 0.2 mg per 100 g of final electrolyte. On the basis of information found in the literature concerning the property of organic substances to reduce HgCl2 experiments were set up to determine the reducing properties of the flour. Subsequent colorimetric determinations of mercury in the electrolyte yielded positive results. To improve the sanitary-hygenic conditions in the shops, it was suggested that mercuric chloride, which is not an electrolyte, be replaced by another less toxic substance, and that substitutes be found for the flour thickener.

07567

Razumov, V. A. and T. K. Aidarov

INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF MERCURY VAPOR CONCENTRATIONS IN THE AIR OF WORK PREMISES. (Kosvennyi spektrofotometricheskii metod opredeleniya parov rtuti v vozdukhe rabochikh pomeshchenii.) Text in Russian. Gigiena i Sanit., 30(7), July 1965. Engl. transl. by JPRS. 0HYG. Sanit., 30(7):81-83, July 1967. CFSTI: TT66-51033/3

The method proposed states that the sample of air for analysis should be taken by drawing 100 l air, at the rate of 5 l/min, into an absorbing solution consisting of 5 ml 0.1 N potassium

permanganate and 5 ml 10% sulfuric acid. The absorbing solution is decanted into a separating funnel and 5% solution of oxalic acid is added in small amounts to destroy the permanganate until the solution is completely decolorized. The volume is then brought up to 20 ml with twice-distilled water prepared in a quartz apparatus, 5 ml of 6 N acetic acid are added, the liquid is shaken and an addition is made of 10 ml dithizone (C.P.) solution in carbon tetrachloride or chloroform, with a concentration of 1 mg/100 ml. The mixture is vigorously shaken for 15 to 20 sec, 10 ml carbon tetrachloride are added, and the liquid is again shaken. The colored extract is then decanted into a cell. Mercuric chloride (0.0135 g) is dissolved in water in a 100 ml volumetric flask (the solution can be used for 6 months). The working standard solution, with a mercury concentration of 1 microgram/ml, is prespared by diluting the basic solution with twice-distilled water to 100 times the original volume. This solution is unstable, and it is not recommended to store it for long. Measurements are carried out by means of an SF-4 spectrophotometer.*

07772

Christie, A. A., A. J. Dunsdon, and B. S. Marshall

FIELD METHODS FOR DETERMINING CERTAIN ORGANOMERCURIAL VAPOURS IN AIR. Analyst, 92(1092):185-191, March 1967. 10 refs.

Two methods are proposed for determining the vapours of certain organomercury compounds in air, at concentrations in the region of 10 microgram of mercury per cu.m. The mercurial vapours are collected either on a glass-fibre pad treated with cadmium sulphide, or on a fluidised bed of active carbon. Mercury vapour is released by heating, and is determined by comparing the colour produced on selenium sulphide testpapers with a range of standard colours. The cadmium sulphide method is applicable to the determination of ethylmercury chloride, ethylmercury phosphate, diphenylmercury and methylmercury dicyandiamide; the fluidised-bed method is also applicable to this range of compounds and, in addition, to diethyl mercury. Mercurial dusts can be determined by the cadmium sulphide method, and mercury vapour by a slight modification of the fluidised-bed technique. In both methods the apparatus used is simple to manipulate and the time needed for a complete determination is less than 30 minutes. (Authors' summary)

08134

A. S. Aruin

DETERMINATION OF MERCURY IN ATMOSPHERIC AIR. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 18-20, May 1960. CFSTI: TT 60-21475

Mercury in atmospheric air is determined colorimetrically. A detailed descriotion of the preparation of samples and standards is given. The experimental samples are compared colorimetrically with the standards.

09333

Lial W. Brewer, (ed.)

ANALYTICAL PROCEDURES FOR THE ENVIRONMENTAL HEALTH LABORATORY. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab., SC-M-3044, 147 p., Feb. 1968. 13 refs.

This is a manual compiled of thirty-nine analytical procedures used by an industrial hygiene laboratory. The procedures for the following substances in air are included: The Determinaton of Acetone, Acid and Alkali Contaminants; Benzene, Toluene, and Other Aromatics; Beryllium (Spectrographic Method); Beryllium (Morin Method); Cadmium; Chromic Acid, Chromates, and Dichromates; Formaldehyde; Lead; Methanol; Nitrogen Dioxide; Oil Mist; Ozone (Colorimetric Method); Ozone (Titration Method; Phosgene; Silica (Colorimetric Method); Sulfur Dioxide; Thallium; and Zinc.

09369

Wilson, H. N. and G. M. Duff

INDUSTRIAL GAS ANALYSIS: A LITERATURE REVIEW. Analyst, 92(1101):723-758, Dec. 1967. 712 refs.

Analytical methods are reviewed for: permanent and inorganic gases; analysis of liquefied or pure gases; fuel gases; flue gases; motor exhaust gases; analysis of micro samples; and atmospheric pollutants. The years from 1958 to about mid-1966 were covered. In no branch of analysis is the swing towards physical methods more marked than in gas analysis. There have been no important developments of the conventional methods during the last ten years; the chief advances have been the application of galvanic methods to 'trace' of certain gases, and gas chromatography. The rapid spread of the electrogalvanic methods for the 'on-stream' determination of traces is also most significant. The other most noticeable feature is the vast and increasing attention being paid to atmospheric pollutants of all kinds, particularly sulphur dioxide, sulphuric acid and hydrocarbons.

09587

Linch, A. L., R. F. Stalzer, and D. T. Lefferts

METHYL AND ETHYL MERCURY COMPOUNDS--RECOVERY FROM AIR AND ANALYSIS. Am. Ind. Hyg. Assoc. J., 29(1):79-86, Jan.-Feb. 1968. 15 refs. (Presented at the 28th Annual Meeting, Ameri- can Industrial Hygiene Association, Chicago, Ill., May 3, 1967.)

Attempts to recover dimethyl or diethyl mercury vapor by absorp- tion in the reagents usually recommended for collection of mercury from air met with failure. The absorber design, whether impinger or porous glass diffustion type, contributed only minor differ- ences. However, 0.1N iodine monochloride in 0.5M hydrochloric acid gave quantitative recoveries of dimethyl and diethyl mercury, monomethyl and monoethyl mercuric chlorides, and mercury vaporized into moving airstreams. The reagent also is applicable to the analysis of mercurial-bearing dusts. Again, the absorber design was not critical but impinger recoveries were rate-dependent. The Teflon permeation tube for SO2 calibration was adopted success- fully to the dynamic calibration of microimpingers developed for personnel monitoring. The ACGIH procedure for analysis was followed after sample collection. (Authors' abstract)

09751

Schmertzing, Hannibal and Julian H. Chaudet

UTILIZATION OF INFRARED SPECTROPHOTOMETRY IN MICROCONTAMINANT STUDIES IN SEALED ENVIRONMENTS. Melpar, Inc., Falls Church, Va., Contract AF 41(609)-1962, Task 793002, SAM-TR-67-2, 20 p., Jan. 1967. CFSTI, DDC: AD 650000

Microcontaminants in a sealed environmental system were separated and identified. The separation and identification of the collected samples were accomplished with gas-liquid chromatography and infrared spectrophotometry. Fifty-four sets of samples of the atmosphere from a space cabin simulator, com-

prising 162 individual samples, were analyzed. The method used was gas-liquid chromatography using a flame ionization detector. The retention time on the column was used for identification, while the peak area was used for quantitative estimation of the compounds. A collection of the vapor infrared spectra of 146 compounds, which are possible contaminants for space cabin simulators, has been compiled during 2 years. A computer program for sorting infrared spectra with the aid of the ASTM deck of infrared cards has been established. Analyses have been made of gases evolved from paint panels, from the decomposition of a Teflon insulator, and from human waste products.

10392

G. Thilliez

RAPID AND PRECISE DETERMINATION BY ATOMIC ABSORPTION OF TRACES OF MERCURY IN THE AIR AND IN BIOLOGICAL MEDIA. (Determination precise et rapide par absorption atomique de traces de mercure dans l'air et dans les milieux biologiques.) Text in French. Chim. Anal. (Paris), 50(5):226-232, May 1968. 4 refs.

A method is described for the determination of traces of mercury. The mercury is fixed on a platinum trap which is then rapidly heated by high-frequency induction; mercury is thus vaporized and conducted to a mercury cathode ray tube. A peak is recorded from this tube (at 155.7 nm.) which corresponds to the mass of mercury. Sensitivity is 1 microgram/cu m. Tests are described in which the levels of mercury in blood and urine samples were determined. Sensitivity in biological samples is 2 microgram/l. when a sample of 1 ml. is used. This method is recommended for its speed (requiring about 15 min.), its sensitivity, and the possibility of avoiding unwanted contaminants and intermediates.

11626

Brune, D., S. Mattsson, and K. Liden

APPLICATION OF A BETATRON IN PHOTONUCLEAR ACTIVATION ANALYSIS. Aktiebolaget Atomenergi (Stockholm), AE-333, 1968. 19 refs.

Determinations of iodine in pharmaceuticals and of fluorine, lead, and mercury in pure compounds were made by photonuclear activation analysis, with a betatron accelerator used as the irradiation facility. The accelerator yields a lower photon flux density than a linear accelerator but has great flexibility with regard to beam direction. Uniform irradiation of the samples was achieved by inserting a rotating sample holder device in the brehmstrahlung beam of the betatron. The detection limits obtained for iodine, fluorine, lead, and mercury were 50, 3, 400, and 15 micrograms, respectively. It is concluded that the betatron has practical applications in the field of pharmacy but is unsuited for lead analyses in pollution studies of air, water, and food. It could be used for the determination of mercury in various biological materials, though better results are expected to be obtained by conventional neutron activation techniques.

15451

Ueda, K.

STUDIES ON THE HARMFUL EFFECTS OF MERCURY WITH SPECIAL REFERENCE TO MERCURY INTOXICATION AMONT DENTAL TECHNICIANS. (Suigin no dokusei ni kansuru kenkyu: Tokumi shikairyo ni okeru suigin- chudoku). Text in Japanese. Shika Gakuho (Monthly Record Dental Sci., Pract., Miscellany), 68(6):941-951, 1968. 22 refs.

Dentists and dental technicians are exposed to the dangers of mercury inhalation and absorption through the skin. The maximum tolerable concentration of mercury vapor in the air is 0.1 mg/cu m. The room where mercury amalgam for fillings is compounded can provide a very hazardous environment if ventilation is inadequate, since mercury under such conditions can reach a level of 19 mg/cu m. A mercury vapor meter which directly measures ambient vapor concentrations by means of a mercury lamp at a wavelength of 253.7 millimicrons is a convenient instrument with a sensitivity of 0.01 mg/cu m. The atmospheric concentration of mercury vapor is directly proportional to the amount of mercury excreted in the urine. The day after receiving a filling, the patient, as well as the dental technicians, show twice to ten times, respectively, the normal amount of mercury excretion. In recent years, mercury vapor meters used in dental offices have helped to maintain a normal level of urinary mercury excretion in dental workers. Allergic reactions to mercury, occurrence of mercury in foods, symptoms of acute and chronic mercury intoxication, and treatment are also discussed.

19506

Kanebo, M., S. Naito, S. Setsuda, and J. Matsuzaki

ATOMIC ABSORPTION PHOTOMETRIC DETERMINATION OF MERCURY IN AIR. (Genshi kyukoh kohdohoh ni yoloo kookichu no sooigin no teilyohoh). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):105, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

An improved method to determine the air-borne mercury by means of atomic absorption photometry is obtained by modifying the method reported by W. Ronald Hatch. Reagents include 1.18 N sulfuric acid; sulfuric acid hydroxyl amine solution where 15 gm of sulfuric acid hydroxyl amine is dissolved into water to 500 ml; tin dichloride solution where 10 gm SnCl2.2H20 is dissolved into 0.5N sulfuric acid to 100 ml; and mercury standard solution; where 1 ml of this solution includes 0.1 mg Hg (2)(+). Air is sampled into the equal-volume mixture of 2N sulfuric acid and 0.3% potassium permanganate solution and added sulfuric acid hydroxyl amine solution to decolorise it; this becomes a sample solution. After 100 ml of the sample solution is added with 25 ml of 18N sulfuric acid, 10 ml of sulfuric acid hydroxyl amine, and 10 ml of tin dichloride solution, it is circulated through a measuring instrument. The concentration of mercury, called C, is obtained by determining the absorption rate of mercury vapor at 253.7 millimicron (A), absorption rate of a standard (As), which consists of 4 ml of mercury standard and water in the total 100 ml, and absorption rate of 100 ml of water (A sub O) as follows:

20944

QUANTITATIVE DETERMINATION OF MERCURY VAPOR IN THE AIR. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:30-33, 1963. (B. S. Levine, ed.) CFSTI: 63-11570

A method for the determination of mercury vapor in the air of industrial premises for sanitary control purposes was described. The method is based on the fact that the formation of CuIHgI2 in solution is accompanied by the development of a red color. This compound becomes mixed with the simultaneously formed copper iodide; in the presence of mercury, it also forms a colorless substance. The air is aspirated at the rate of 2 l/min through two consecutively placed absorbers, each containing 10 ml of absorber solution. The content of each absorber is analyzed separately. The absorber solution is

poured into a 10 ml cylinder graduate. The glass absorber is rinsed with a small amount of water and poured into the same cylinder graduate. Fresh absorber solution is added to obtain a total of 10 ml of solution. Five ml of the solution from each 10 cylinder graduate is placed in separate centrifuge tubes. A standard scale is prepared at the same time. One ml of the composite solution is added to all the tubes and shaken cautiously. The solutions then are allowed to stand for 5-10 min to complete the precipitation of CuIHgI2. The precipitates in the centrifuge tubes are then colorimetrically compared. The sensitivity of the method is 0.3 mg of mercury in the analyzed volume. The reaction is nonspecific in the presence of mercuric chloride or organic mercury compounds.

23771

Patton, W. F. and J. A. Brink, Jr.

NEW EQUIPMENT AND TECHNIQUES FOR SAMPLING CHEMICAL PROCESS GASES. J. Air Pollution Control Assoc., 13(4):162-166, April 1963. 7 refs (Presented at the Air Pollution Control Association, 55th Annual Meeting, Chicago, May 20-24, 1962.)

When the need for improved sampling equipment and techniques was recognized at Monsanto a number of years ago, a cascade impactor suitable for adiabatic measurements on process gases was developed. Simpler equipment, suitable for routine control of air pollution, can determine accurately the weight or chemical composition of the particles in a gas stream, as well as separately determine the loading of particles greater than three micron in diameter from particles smaller than this. The dust or mist sampling device is contained in a small case with a carrying handle and removable sides similar to an Orsat analyzer. Gases first enter the cyclone where the larger particles are collected, while the smaller particles are carried over and collected by the filter. Sampling preparations are discussed for large particles, fine particles, and isokinetic sampling. The procedures for sampling are outlined, as well as an example for sulfuric acid mist. Calculations of loadings from sampling data are also indicated. Eight sets of the sampling equipment have been utilized for sulfuric, phosphoric, and nitric acid mists, mercury mist, various phosphate salt dust, ammonium chloride fume, ammonium nitrate fume, and several organic mists.

25431

Aughey, Henry

A RAPID MOBILE ANALYZER FOR MINUTE AMOUNTS OF LEAD IN AIR. J. Opt. Soc. Am., 39(4):292-293, April 1949. 2 refs.

A mobile instrument of extreme sensitivity is described which furnishes a rapid indication and an approximate assay of localized relatively high concentrations of lead, combined or elemental. Samples are drawn through a condensed spark discharge adjusted to minimize air lines and to excite the lead spectrum which is photographed with a small quartz instrument. Visual examination of a series of exposures provides data on lead concentration as a function of time and location. A sensitivity of better than one part in 20 million can be maintained in routine operation. Instanteous response realized by substitution of a specially- designed photoelectric Geiger counter for the photographic plate. The technique is not yet developed to a point where continuous quantitative measurements are available over periods of many hours or days. Although tried only for lead, similar sensitivity for mercury is expected. The high energy of the spark source permits excitation of materials present both in elemental and combined forms and offers in addition a rapid analysis when extreme sensitivity is not needed, as for dusts involving such elements as arsenic, barium, and beryllium. (Author abstract modified)

26275

Chatigny, M. A., J. C. Craig, J. C. Edinger, G. Forester, J. E. Gill, W. D. MacLeod, R. C. Maninger, T. Schneck, Jr., E. R. Stephens, K. G. P. Sulzmann, and H. W. Wolochow

POLLUTANT MEASUREMENT AND MONITORING INSTRUMENTATION TASK FORCE ASSESSMENT. In: Project Clean Air. California Univ., Berkeley, Task Force 6, 170p., Sept. 1, 1970. 237 refs.

Instrumentation concepts and devices for the measurement and monitoring of air pollutants have been subdivided into three principle categories of application: ambient air and emission source monitoring for regulatory purposes and for control, vehicle emission monitoring and control, and research in pollution chemistry and laboratory analysis of pollutants. Currently available instruments are discussed, including oxidant analyzers, electrochemical analyzers, chromatography, spectroscopy, photoelectric devices, and particulate and gas samplers, while research needed is indicated. An instrument is needed for quantitative plume capacity measurements, to measure ambient air concentrations of hydrogen sulfide with a sensitivity and accuracy of 1-3 ppb over a range of 1-100 ppb, and a simple instrument is needed for measurements of the total aldehyde concentration, as well as lead, mercury, and chlorine. Improvements in the area of light and laser applications are also indicated. There is a need for rapid and valid verification methods for the proper functioning of present and future car emission control devices. Low-cost instruments and systems are needed in the study of urban diffusion processes. There is a need to devise ways for using the electron microscope. Various other projects are cited.

27389

Delaughter, Buford

MERCURY DETERMINATION IN INDUSTRIAL PLANT ATMOSPHERES BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. Atomic Absorption Newsletter, 9(2):49-50, March-April 1970. 2 refs.

A simple and accurate procedure is described for the determination by atomic absorption spectrophotometry of any form of mercury in industrial atmospheres. A sample of air containing mercury vapor is collected by scrubbing through a 1 N hydrochloric acid solution, the pH of which is adjusted to 2.5-4.0 with mercury-free caustic and chelated with ammonium pyrrolidine dithiocarbamate (APDC). The resulting complex is extracted into an organic medium, and the concentration of mercury determined from absorbance at 2537 A. An equation is given for finding the concentration of mercury in air from the concentration in the extracted sample.

28126

Fukui, Shozo

MEASUREMENT OF DELETERIOUS GAS. (Yugai gasu no sokuteihoho). Text in Japanese. Preprint, Society of Electro-Chemistry, Tokyo (Japan), Kanto Div., 24p., 1971. (Presented at the Seminar on Air Pollution, Tokyo, Japan, Feb. 3-4, 1971, Paper 5.)

The photometric determination of deleterious gases is considered, as well as the analysis of heavy metals in the atmosphere by an atomic absorption method, and the determination of atmospheric concentrations of organic solvents by gas chromatography. Accordin to the type of gas to be measured, sampling and preparation of test chemical solutions are in-

dicated. Measuring procedures are presented for hydrogen sulfide, sulfur dioxide, ammonia, hydrogen fluoride, nitrogen dioxide, nitrogen dioxide plus nitric oxide, hydrogen chloride, chlorine, oxidants and ozone. The chemical analyses of heavy metals includes the determination of mercury, lead, cadmium, zinc, copper, iron, and manganese. For example, mercury vapor is absorbed in a sulfuric acid potassium permanganate s. . tion and heated slowly for 30 min. A hydroxilamine solution is added to decolor the potassium permanganate, and a stannous chloride solution is added to reduce the mercury. Vaporized by circulating air, the mercury is absorbed by an absorption cell and measured at 253.7 millimicrons. The gas chromatographic method is introduced for the measurement of acetone, chloroform, carbon tetrachloride, cyclohexene, tetrachloroethane, phenol, and other organic solvents in the atmosphere.

28214

Hemeon, Wesley C. L. and George F. Haines, Jr.

AUTOMATIC SAMPLING AND DETERMINATION OF MICRO-QUANTITIES OF MERCURY VAPOR. Am. Ind. Hyg. Assoc. J., vol. 22:75-79, Feb. 1961. 1 ref

A new technique for the automatic sampling and determination of mercury vapors is based on supplying the AISI smoke sampler with Whatman No. 4 filter paper impregnated with a solution of iodine in potassium iodide. The mercury trapped by the treated filter paper is then volatilized in a procedure that releases mercury as a vapor into a stream of air which passes through a sensitive to mercury vapor concentration as low as 0.005 ppm. This method would have value in an industrial hygiene situation where automatic sampling at several locations is desirable for evaluating a mercury hazard. Details of the procedure and calibration are given.

28338

Krivan, V.

A RADIO-RELEASE TECHNIQUE FOR DETERMINING TRACES OF ELEMENTS. Z. Anal. Chem., vol. 253:192-194, 1971. 9 refs.

Trace elements are determined by fixing a small amount of an insoluble compound on a small disc of filter paper or other suitable material. The exchangeable ions of the compound are labelled with a radioactive isotope and are then replaced with ions of the trace element to be determined in a solution. After the labelled ions are released from the carrier into the solution by shaking, the activity of the species released is measured and compared with one or a series of standards processed in the same way. When the technique was used to determine trace amounts of mercury in the presence of several other elements, radioactively labelled silver sulfide and filter paper discs were used. The results obtained are summarized and the advantages and limitations of the method are discussed. (Author abstract modified)

28354

Kaiser, Gerhard, Peter Tschoepel, and Guenther Toelg

DECOMPOSITION WITH ACTIVATED OXYGEN IN THE DETERMINATION OF EXTREMELY LOW CONTENTS OF TRACE ELEMENTS IN ORGANIC MATERIALS. (Aufschluss mit aktiviertem Sauerstoff bei Bestimmung extrem niedriger Spurenelemenigehalte in organischem Material). Text in German. Z. Anal. Chem., vol. 253:177-179, 1971. 4 refs.

To determine elements in nanogram concentrations, the principle of low temperature ashing was modified by using microwave frequencies for oxygen activation. Through contact with the oxygen plasma, the 1-gram sample burns slowly from top to bottom. The intensityof the microwave field and the position of the substance with respect to the plasma control the combustion process. The combustion products are dissolved in 500 microliters of acid, separated, and analyzed. The method was tested with radio nuclides of the volatile elements selenium, zinc, and mercury. It can be also used to determine small concentrations of beryllium in the air.

28450

Polozhayev, N. G., V. V. Girina, and T. Ye. Laktionova

MICROMETHODS OF DETERMINING HARMFUL SUBSTANCES IN ATMOSPHERIC AIR. (Mikrometody opredeleniya vrednykh veshchestv v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 8:15-20, 1951.

Microanalytic nephelometric and colorimetric methods for determining a number of air pollutants are described. Detection sensitivities are as follows: chlorine, 0.002 mg; hydrogen sulfide 0.0002 mg; sulfur dioxide, 0.002 mg; lead, 0.001 mg; and mercury, 0.00005 mg. Air microsamplers are also described.

28505

Kanagawa Prefecture (Japan)

GAS CHROMATOGRAPHY AND ITS DEVICE EQUIPPED WITH ELECTRONIC ARRESTOR TYPE DETECTOR SPECIFIED IN REGULATIONS CONCERNED WITH ENVIRONMENTAL POLLUTION STANDARDS. (Kogai no kijun ni kansuru kisoku ni kiteisuru denshihokakugata kenshutsuki tsuki gasu kuromatografuho to). Text in Japanese. Kanagawa Prefecture Official Bull., no. 70, 4p., Dec. 1, 1970.

The standard procedures are presented for gas chromatographic and atomic absorption analysis of mercury, cadmium, zinc, copper, manganese, and iron. The bulletin stipulates the analytical procedures, including the preparation of test solutions, measuring methods, and calculating methods that are to be followed. The preparation of the cysteine acetate solution and methyl chlorida mercury standard solution, both reagents used in gas chromatography are presented. Hydrochloric acid L-cysteine (1 g), sodium acetate (775 mg), and sodium sulfuric anhydride (12.5 g) are dissolved in water to make 100 ml of solution. Benzene (pretreated by gas chromatography) is added to 100 mg of methyl chloride mercury to make a solution. This solution is removed into a flask and mixed with an additional amount of benzene to make 1000 ml of the solution. Of this, 10 ml is mixed with another additional amount of benzene to make 100 ml of solution. This dilution process should be repeated twice to make the methyl chloride mercury standard solution. One ml of the solution equals 0.1ugCH3HgCl equal: 0.0799ugHg. Preparation of the prescribed test and no-load test solutions is also given in detail. As to measurement procedures, micromilliters is taken from both the test and no-load test solutions by means of a micro-syringe and injected into the gas chromatograph respectively. The height of the peak is then measured for both solutions and taken as H and Hb respectively. The v micromililiters of the methyl chloride mercury solution is similarly injected into the gas chromatograph. The height of the peak measured is then taken as Hs (100 mm or higher). When the value of H-Hb/Hs is higher than 1/20, the density C (ppm) of mercury in the form of methyl mercury in the solution can be calculated as: C(ppm) equals 0.1 times v times H-Hb/Hs times 5/V times 1/quantity of the sample (ml) times 0.799. The procedures for atomic absorbent are also prescribed in similar detail.

28583

Valic, Fedor and Morris B. Jacobs

ASSESSMENT OF MERCURY AIR CONCENTRATIONS IN A WORK ENVIRONMENT. Am. Ind. Hyg. Assoc. J., 26(3):266-269, May-June 1965. 12 refs.

Ultraviolet photometry with mercury vapor meters and the iodine- iodide method were employed to determine mercury concentrations in a mercury mine and smelter in Yugoslavia. Mercury vapor concentrations, as obtained by ultraviolet photometry, were 0.1 to 2.0 mg/cu m in the mine and 0 to 2.0 mg/cu m in the smelter. Total mercury concentrations were 0.16 to 4.89 mg/cu m in the mine. The higher values obtained by the iodine-iodide method imply that monitoring solely with mercury vapor concentration devices may be inadequate for industrial hygiene purposes.

29343

Shirasawa, Tadao

RESEARCHES ON ENVIRONMENTAL POLLUTION MEASUREMENT. (Kogai keisokuho ni kansuru kenkyu). Text in Japanese. Kokuritsu Kenkyujo no Kenkyu Seika (Researches of Government Research Inst.), no. 1, p. 291, Dec. 1969. 9 refs.

In the field of air pollution, the method of monitoring dust density and particle size distribution is being established and control measure studied. The continuous monitoring of sulfur dioxides is studied, together with the effects of accompanying substances. Other harmful gases specified by the law, such as fluorine, are also investigated. In the area of water pollution, minute metal contents in industrial and mining effluents are being studied. Above all, a rapid and high sensitivity quantitative analysis of cadmium and mercury is aimed at. The results already obtained in the fields mentioned above were used as a basis of establishing Japanese Industrial Standards on dust and SO2 measurements of combustion exhaust and also on the test method for plant effluents. The results are also utilized for the public nuisance countermeasure of factories. The Government Research Institute is cooperating with the local governments, municipalities, and private industries in the education of staffs dealing with public nuisances.

29480

Kuroda, Daisuke

QUANTITATIVE ANALYSIS OF NO IN ATMOSPHERE - ON CHANGES IN SALTZMAN COEFFICIENT WITH CHANGE IN COMPOSITION OF SALTZMAN REAGENTS. (Zarutsuman shiyaku no sosei ni yoru Zarutsuman keisu no hendo ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society, Annual Meeting, 24th, Tokyo, March 1971, Paper 3336.)

The relationship between the mixed reagents of Saltzman type and the Saltzman coefficient was measured. To sulfanilic acid 5 g/l, N-1-naphthylethylenediaminedihydrochloride (NEDA), 50 mg/l and n-butylalcohol 10 ml/l solution, (a) were added acetate 50 ml/l, (b citric acid 15 g/l, (c) tartaric acid 15 g/l, and (d) sulfuric acid 0.07 ml/l respectively, and mixed reagents were prepared. To each of 7 ml of (a)-(d), 10 ng nitrogen dioxide/10 min was absorbed, and the Saltzman coefficient was measured: (a) equals 0.91, (b) equals 0.87, (c) equals 0.90 and (d) equals 0.82. These figures varied with the concentration of NEDA, concentration of acids, velocity of air, and temperature. The NEDA concentration had the greatest effect. For instance, when NEDA concentration was 140 mg/l, in reagent (d), the Saltzman coefficient was 0.63. While the diazotation reagent was removed from reagents (a)-(d) and NO2 was added, there was a reaction with NEDA. The reaction was a rapid one; three minutes after the addition of NO2, 90% of the NO2 was consumed and five minutes after, 99%. When this reaction took place while air was let in, a samll quantity of NO2 and a great quantity of NO were emitted. The emission rate of NO to NO2 was: (a) equals 75%, (b) equals 76%, (c) equals 68%, (d) equals 93%. There was no NO2 present in the solution after the air was let through, and it looked slightly yellowish. Six ml of (a)-(d) reagents were taken into a bubbler with glass filter, and while air was let through 10 mg of NO2 was poured in. The generation rate of NO was: (a) equals 4%, (b) equals 8%, (c) equals 7%, (d) equals 17%. The rate of coloring of NO2 without air was: (a) equals 94%, (b) equals 92%, (c) equals 93%, and (d) equals 83%, and the loss was (a) equals 4%, (b) equals 8%, (c) equals 7% and (17%), corresponding fully with the generation rate of NO. The coloring rate of NO2 corresponds to the Saltzman coefficient measured at first. The Saltzman coefficient is slightly lower because the absorption of NO2 and addition of NO2 are not carried out under identical conditions, so that there is a difference in the rate of reaction of NEDA-NO2. A formula is obtained showing the concentration of NO2 is proportional to the degree of light absorption while letting the air through. Therefore, if a spectrum is made, using the figure measured by letting the air through a standard NO2 solution, under the same conditions as when gas was sampled, the gas concentration can be obtained directly. The Saltzman coefficient varies as the NEDA-NO2 reaction degree varies, with the different components of reagents and condition of sampling the gas. If measurement is made as above, the Saltzman coefficient can always be regarded as 1.

29652

Krause, Leonard A., Richard Henderson, Henry P. Shotwell, and Dale A. Culp

THE ANALYSIS OF MERCURY IN URINE, BLOOD, WATER, AND AIR. Am. Ind. Hyg. Assoc. J., 35(5):331-337, May 1971. 7 refs.

A procedure for the analysis of mercury in air, water, urine, and blood is described. It is dependent on the rapid release of mercury from digested specimens by using stannous chloride. The apparatus consists of an all-glass reaction vessel with a receiving funnel insert, connected to a water scrubber by means of a three-way stopcock. From the scrubber, glass fittings attach to an optical cell. A No. 1 Whatman filter is inserted at one point to remove possible droplets of moisture, while aspiration is through coarse frits positioned to fit near the bottom of the flasks. All glass joints are ball-and-socket held by appropriate pinch clamps. A flow meter calibrated for rates between 1 and 4 liters/min is inserted downstream of the optical cell and before the vacuum pump. The Beckman Model K-23 double-scale mercury vapor test meter used in these experiments was altered by removing the grille, and mounting and positioning an all-glass optical cell 22.5 cm in length by 4 cm in diameter (fitted with inlet and outlet ports) and with quartz glass windows fused into the ends. Reagents and preparation of the standard curve are discussed. Concentrations of mercury below one part per billion can be detected accurately by increasing the aliquot of the sample.

29770

Nishimura, Kunio and Tohru Hirayama

INVESTIGATION OF ACTIVATION ANALYSIS OF TRACE MERCURY IN GAS BY RADIOISOTOPE TRACER METHOD. Text in Japanese. Radioisotopes, 17(12):24-30, Dec. 1968. 12 refs.

Most chemical determination methods for mercury in gas consist of the collection of mercury from a large volume of gas followed by an estimation of the amount collected. While the dithizone method has many advantages for small quantity determinations, impurities interfere with this method. A neutron activation analysis is suitable for small quantity determinations because of its high sensitivity. The radioisotope tracer technique and activation analysis are very useful for this method. These techniques were used to establish a method, and the results were compared to those by the dithizone and gas detector tube methods. The absorbent was a saturated chlorine solution. After a two hour absorption, four ml of concentrated aqueous nitric acid solution was added to the absorbent. Then the mixture was concentrated to eight ml and sealed in the quartz capsule. Irradiation was carried out in HTR with neutron flux of 1.2 times 10 to the 11th power n/sq cm sec for five hours. After cooling for 100 hours, samples were taken from the capsule and determined by the non-destructive method. The sensitivity of this method was .0001 mg/cu m. However, the sensitivity can be improved by using irradiation with higher neutron fluxes and destructive methods.

30199

Larsson, Leif

PORTABLE APPARATUS FOR DETERMINING MERCURY IN AIR. (Baebar apparat foer bestaemning av kvicksilver i luft). Text in Swedish. Svensk. Papperstid (Stockholm), 74(8):241-244, April 1971.

A method for the determination of mercury in air with the aid of a light, portable device is described. The method is based on the absorption of mercury in an ampoule containing a carrier impregnated with potassium permanganate solution acidified with sulfuric acid. The absorption of the mercury is quantitative. In a subsequent step the mercury is extracted from the ampoule and can then be determined by a suitable wet chemical method. This method has been used for measurements in a chloralkali mill. (Author summary modified)

30510

Weissler, Alfred

HAZARDS OF MERCURY: ANALYTICAL METHODS. Environ. Res., 4(1): 53-61, March 1971.

Methods have been developed in Sweden, Denmark, and Finland for the analysis of fish, other foods, and body tissues for total mercury content by neutron activation analysis, atomic absorption, spectrophotometry, and for methylmercury and other organomercurials by gas chromatography. These methods have been used successfully for extensive surveys of the extent of mercury contamination to determine the magnitude of the public health hazard. As a result of intensive development and extensive experience, the analytic methods used in Scandinavia and Finland are more sensitive and reliable than those of many laboratories in the United States. An increased adaptation and use of the Scandinavian procedures for determining submicrogram amounts of mercury is recommended. Analytic methods should be developed to distinguish and measure methylmercury, phenylmercury, dimethylmercury, methoxyethylmercury, other organomercurials, and inorganic mercury compounds. Methods should also be developed for determining small concentrations of mercury and its compounds in air at a sensitivity of at least 1 ng/cu m.

30635

Kanno, Saburo

MICROANALYSIS OF HEAVY METAL IONS IN THE ENVIRONMENT AND THE PROBLEMS AT ISSUE. (Kankyochuno biryo jukinzoku no bunsekiho to mondaiten). Text in Japanese. Preprint, Society of Electro-chemistry, Tokyo (Japan), 34p., 1970. (Presented at the Society of Electrochemistry Industrial Public Nuisance Control Seminar, Tokyo, Japan, Dec. 2-3, 1970, Paper 7.)

Representative methods for the microanalysis of mercury alkyl, total mercury, cadmium, lead, copper, zinc, and arsenic, and lead in the atmosphere and gasoline were discussed by describing the test procedures for each method. For the analysis of mercury alkyl, gas chromatography was described, while listing the test chemicals, apparatus, preparation of the test sample, and the test procedures. Procedures for the microanalysis of total mercury by an atomic absorption analysis method were described, including the test apparatus, test chemicals, prepartion of the samples, and the testing. The additional remarks included: How to prevent mercury from volatilizing during decomposition of the sample; quality of the absorption cell body, selection of desiccative, absorbency against quantity of stannous chloride solution added, effect of coexisting ions; calibration curve and reproducibility, plotting in chart, effect of temperature, recovery test of mercury, and arresting mercury from air. Atomic absorption analysis procedures for the microanalysis of cadmium, lead, copper, and zinc were also described. For the microanalysis of arsenic, procecures of the silver diethyl thiocarbamate method were described. Atomic absorption analysis procedures for analysis of lead in the atmosphere and gasoline were also given. Attached as enclosures were the Environmental Criteria Concerning Water Pollution and the Results of Analysis of the Tokyo Bay s Bottom Sludge.

31171

Jones, J. D., J. M. Rottschafer, H. B. Mark, K. E. Paulsen, and G. J. Patriarche

DETERMINATION OF TRACES OF MERCURY IN BIOLOGICAL MATERIAL BY NEUTRON ACTIVATION. (Determination de traces de mercure dans les systemes biologiques par activation de neutrons). Text in French. Mikrochim. Acta (Vienna), 1971(3):399-404, July 1971. 28 refs.

A simple and fast method for the trace analysis of mercury in the blood, urine, tissue, and in the atmosphere by neutron activation is presented. The activated mercury, as an $HgCl_4^{2-}$ complex, is retained on an anion exchange resin which is counted directly. In the human blood, 19 ppb of mercury were measured with this method, in human hair 251 ppm. In fish, concentrations between 0.86 and 0.58 ppm were measured. The standard deviation in these concentration ranges was plus or minus 10%. (Author abstract modified)

31862

Malenfant, Arthur L., Stanley B. Smith, and Jae Y. Hwang

MERCURY POLLUTION MONITORING BY ATOMIC ABSORPTION UTILIZING A GAS CELL TECHNIQUE. Preprint, 8p., 1970. 11 refs. (Presented at th Eastern Analytical Symposium, 12th, Annual, Nov. 19, 1970.)

The determination of mercury in fish, urine, and air samples by atomic absorption is reviewed. The system design, procedure, and typical results are presented. The methods provide for the aeration, or evolution, of all the mercury contained in the original samples at the appropriate time. Only 2 manograms of mercury were required for 1% absorption at the

peak height (0.0044 Abs). Interference in the methods centered around the presence of other easily reducible substances; selenium, as well as silver, gold, platinum, and palladium gave low results. The working curve of mercury was linear over several orders of magnitude in concentration. Under the conditions established, sensitivity was unaffected by sample volume as long as total volume was less than 10 - 12 ml. The technique used was open- ended. To shorten analysis time, the mercury was reduced and then passed into the absorption cell. A reasonably constant flow rate of the gas through the absorption cell was necessary to permit the profile of the mercury sample to reproduce. When the flow rate was too slow, the peak was broadened by diffusion; when it was too high, the sample was flushed through the absorption cell too rapidly for proper response and sensitivity was lost. Recovery experiments were performed to test the accuracy of the methods.

32476

Fukui, Shozo

METHOD OF MEASUREMENT OF HARMFUL MATTERS IN AIR. (Kuki chu no yugaisei busshitsu no sokutei hoho). Text in Japanese. Bunseki Kiki (Analysis Instr.), 9(8):43-59, Aug. 1971. 1 ref.

Various measurement methods of harmful matter in the atmosphere are examined. The orthotolidine method is described for chlorine determination, but there is no reliable method for a high incidence of pollution by chlorine gas. The neutral iodine potassium method for ozone and oxidants; the atom light absorption method for cadmium; the pyridine pyrazole and palladium quinolinol methods for hydrogen cyanide; the dithizone and atom light absorption methods for mercury; and the diazotation and Saltzman methods for nitrogen oxides are reviewed. The atom light absorption method is generally used for lead and zinc, since it is simple and accurate. Sulfur dioxide is trapped with sodium chloride and mercuric chloride in solution; rosaniline formaldehyde is then added, and the mauve color is determined. Fluorides or hydrofluorine are measured by colorimetry, i.e., the lanter-alizarin complexion method. The 3-methyl-benzo-thiazolon- hydrazone method, which is most sensitive, and the chromotropic method are used to measure formaldehyde. Hydrogen sulfide is determined by the methylene blue method, the molybdenum blue method, and the starch iodine method. The methylene blue method gives a unique reaction and involves less obstruction. A new method for trapping sulfides is examined.

32534

Fujinaga, Taichiro and Mutsuo Koyama

ENVIRONMENTAL POLLUTION ANALYSIS -- ESPECIALLY ON THE BASIC APPROACH TOWARD IT. (Kogai bunseki -- Tokuni sono kangaekata ni tsuite). Text in Japanese. Bunseki Kiki (Analysis Instr.), 9(7):3-9, July 1971. 13 refs.

The basic characteristics of an environmental pollution analysis are discussed to clarify the basic approach required for an analysis that is usually of complex nature. Often organic and inorganic analyses must be performed simultaneously. Moreover, an analysis is more than simply qualitative or quantitative. A qualitative analysis intended simply to detect a polluting element in air or water is often meaningless; very often the toxicity of a particular element depends on its chemical state. Therefore, microanalysis or, more properly, trace analysis is required to detect extremely toxic substances. If possible, pollution should be continuously monitored and analyzed. The most dependable of current measuring devices are, theoretically, those employing ion-selective electrodes. Sampling, pretreatment, and measurement methods, together with measurable range and references, are tabulated for different air pollutants. The methods are as follows: dust (particulates), reflection factor or transmittivity measurement; sediment, gravimetric analysis; precipitation density, X-ray, light-dispersion, and gravimetric. X-ray microprobe analysis, fluorescent X-ray analysis, radiometry, emission spectrochemical analysis, atomic absorption spectrochemical analysis, absorption photometry, polarography, and gas chromatography are used for metals and other noxious elements. For carbon monoxide or carbon dioxide measurements, conductometry, coulometry, visible absorption photometry, and ultraviolet absorption photometry are used. Turbidimetry, coulometry, and conductometry are used for hydrogen sulfide measurements. Coulometric titration and absorption photometry are used for oxidant measurements. Nitrogen dioxide or nitric oxide measurements use visible radiation absorption photometry. Organics are measured by gas chromatography. Ammonia, aldehydes, fluorine, phenyl acetate, mercury, tetraethyl lead and hydrogen cyanide use visible radiation absorption photometry.

32718

Fujiwara, Toshizo, Hideo Okashita, and Hiroshi Tsukiyama

X-RAY FLUORESCENCE ANALYSIS OF SPECIMENS RELATED TO ENVIRONMENTAL POLLUTION. (Kogai kankei shiryo no keiko X-sen bunseki). Text i Japanese. Shimazu Hyoron (Shimazu Rev.), 28(2):87-91, June 1971. 5 refs.

X-ray fluorescence spectrometry was used to analyze aqueous solutions, heavy oils, dusts, and various deposits, as environmental pollutants. The sensitivity was improved by enhancing the peak-to-background ratio, and the interference of bubbles in liquid samples was eliminated. Examples of determination of mercury and arsenic in an aqueous solution and of sulfur in heavy oil are given. Dust was analyzed by adsorption and trapping on filter glass, with special attention to the background of the glass filter. A sample of mud accumulated at the bottom of the sea was dried and crushed for analysis; it contained barium, zirconium, bromide, lead, zinc, iron, and manganese. Detection sensitivity was improved by condensing the aqueous solution samples.

33042

Wainerdi, R. E., L. E. Fite, and W. E. Kuykendall

NUCLEAR ANALYTICAL METHODS AND SYSTEMS FOR THE MEASUREMENT OF TRACE CONSTITUENTS IN THE ENVIRONMENT. International Atomic Energy Agency, Vienna (Austria), Nucl. Tech. Environ. Pollut., Proc. Symp., Salzburg (Austria), 1970, p. 459-480. 81 refs. (Oct. 26-30, Paper IAEA-SM-142a/28.)

Nuclear and other methods of microanalysis can provide important information about the normal and abnormal concentration levels of trace elements in living systems and in their environment. Activation analysis, especially using gathered samples returned to well-equipped central laboratories, can provide extensive elemental and isotopic information, especially when automated analytical spectrometers and computer data processing are employed. Isotope dilution, radiation reflection, and other nuclear methods can also provide additional important information about the normal levels of trace elements in the ecosystem and their dispersion and about the magnitudes of environmental effects caused by such materials. Many materials of known toxicity, such as mercury, silver, bromine, and lead, lend themselves to microanalysis using neutron, charged particle (proton), or photonuclear activation analysis. A summary is given of trace analyses of aerosols, marine aerosols, particulates, rain and snow, water from rivers and bays,, tissues, fish, and tobacco, performed by neutron activation analysis.

33277

Asperger, Smiljko and Ivo Murati

DETERMINATION OF MERCURY IN THE ATMOSPHERE. SUBMICROANALYTICAL DETERMINATION OF MERCURIC ION IN BROMINE AND CHLORINE WATER BASED ON ITS CATALYTIC ACTION. Anal. Chem., 26(3):543-545, March 1954. 12 refs.

Mercuric ions in bromine and chlorine water were determined by spectrophotometric estimation of the violet complex produced by the catalytic action of the ions on potassium ferrocyanide and nitrosobenzene in aqueous solution. Since the catalytic activity of the mercuric ions was measured without disturbance, the determination of mercury in the atmosphere can be reduced to a determination of mercuric ions. A statistical treatment of the experimental results shows that the relative standard error of the proposed method is about 9.5% when the concentration of mercuric ions in the solution is 0.000001 to 0.000005 mole/liter.

33278

Quino, E. A.

DETERMINATION OF DIBUTYL MERCURY VAPORS IN AIR. Am. Ind. Hyg. Assoc. J., 23(3):231-234, May-June 1962. 10 refs.

Dibutyl mercury vapors in air can be collected in 99% isopropyl alcohol in two impingers in series. Determination is made by bromination followed by reaction with dithizone. In the laboratory, 2-12 micrograms can be determined. A field procedure determines concentrations as low as 0.5 mg/cu m. Eighteen atmospheric samples containing organic mercury can be analyzed by the bromination method in one hour or less in contrast to the two to three days required by traditional methods. (Author abstract modified)

33338

Berman, Eleanor

APPLICATIONS OF ATOMIC ABSORPTION SPECTROMETRY TO TRACE METAL ANALYSES OF TOXICOLOGICAL MATERIALS. Progr. Chem. Toxicol., vol. 4:155-178, 1969. 44 refs.

The instruments, principles and procedures used in atomic absorption spectrometry are described. This method has become an important tool for the determination of various metals during toxicological investigations and is the routine technique for analyses of lead, cadmium, thallium, mercury, and arsenic. Atomic absorption spectrometry can be used to determine the presence of lead, mercury, copper, gold, and iron in blood, urine, and body tissue. The trace analyses of cadmium, thallium, arsenic, antimony, bismuth, cobalt, chromium, lithium, manganese, nickel, tin, and zinc are also explained.

33886

Stitt, Fred and Yoshio Tomimatsu

SENSITIZED PAPER FOR ESTIMATION OF MERCURY VAPOR. Anal. Chem., 23(8):1098-1101, Aug. 1951. 7 refs. (Presented at the American Chemical Society, 115th Meeting, San Francisco, Calif., March 27-April 1, 1949.)

In the course of developing a portable instrument for measuring small amounts of ethylene in air by use of hot mercuric oxide as an oxidizing agent, sensitized paper suitable for detecting and estimating mercury vapor was studied. A paper both uniform and reproducible (plus or minus 5%) in its response to mercury vapor and relatively insensitive to temperature was prepared by a method which impregnates the paper with only selenium as the reactive material. Preparation of the paper involved soaking it in potassium selenocyanate solution, draining, and exposing it to a hydrogen chloride atmosphere. The quantity of reactive material per unit area of paper is easily controlled by adjusting the concentration of selenocyanate. The properties of this paper were compared with those of selenium sulfide papers prepared by three different procedures, when used in the form of a strip over which a fixed volume of sample is slowly passed. A temperature of 65 C or above was required for maximum reactivity of the mercury vapor with the reactive material on each of the sensitized papers. The length of blackening of selenium paper is directly proportional to the mercury vapor concentration and is insensitive to paper temperatures between 65 and 200 C. Both selenium and selenium sulfide papers retained their original calibration after a year of storage at room temperature in the dark. (Author abstract modified)

34388

Ulrich, William F.

SOLUTIONS FROM SPECTRA. Ind. Res., 13(6):52-55, June 1971.

Aside from the countless routine colorimetric and spectrophotometric methods for water analysis, spectroscopic techniques are applied to a number of difficult and often spectacular problems. At present, the determination of trace mercury is best performed by the so-called flameless atomic absorption technique. For analysis, the water sample is treated with a reducing agent that converts mercury into the atomic state. Then, a gas purge sweeps the mercury, as a vapor, into a gas cell where it is measured by its absorption at 253.7 nm. Phenolics are commonly determined as a group either by a colorimetric procedure or by their own natural absorbance in the ultraviolet. Total organics are first broken down to form carbon dioxide and then determined using a non-dispersive type analyzer. Determination of the chlorinated pesticides, biological species, ozone, and various drugs is also discussed. One promising method for the measurement of bacteria and viruses is based on the bioluminescence observed when adenosine triphosphate reacts with hydroluciferin in the presence of the enzyme, luciferase. An interesting new technique for detecting morphine involves use of electron spin resonance spectroscopy and spin labels.

34432

Christian, G. M., II and J. W. Robinson

THE DIRECT DETERMINATION OF CADMIUM AND MERCURY IN THE ATMOSPHERE. Anal. Chim. Acta, 56(3):466-470, Oct. 1971. 6 refs.

Cadmium and mercury in laboratory air were directly determined by passing air samples through an injection furnace, by passing injector effluent through a nitric acid scrubber, and by analyzing the scrubber solutions by atomic absorption. The concentrations of the metals in the ambient atmosphere were then obtained by comparison of absorption measurements with calibration curves. The sensitivity of the method was 1.2 microgram/cu m and 0.02 microgram/cu m for mercury and cadmium, respectively. No evidence of interference by the chemical form of mercury was detected for the compounds studied. Chloro-compounds caused changes in percentage absorption, but the concentrations of organic chlorine compounds used in interference studies were higher than normal ambient concentrations.

34641

Carter, J. A. and J. R. Sites

DETERMINING PPB MERCURY CONCENTRATIONS USING A SPARK-SOURCE MASS SPECTROMETER SAMPLE CHANGER. Anal. Letters, 4(6):351-355, June 1971. 2 refs.

A probe-type sample changer has been added to a spark-source mass spectrometer for the rapid determination of ppb levels of mercury by isotope dilution. The initial purpose for adding the changer was to run large sets of fish and environmental samples for their mercury content as rapidly as possible, but the technique has also been used for determining cadmium, mercury, and zirconium in samples of air, water, and urine. Transmittances of the appropriate lines on the photoplate are read on a microdensitometer; calculations are made using a short computer program that applies the emulsion calibration curve and corrects for interfering relative isotopic abundance. (Author abstract modified)

34808

Moffitt, A. E., Jr. and R. E. Kupel

A RAPID METHOD EMPLOYING IMPREGANTED CHARCOAL AND ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR THE DETERMINATION OF MERCURY IN ATMOSPHERIC, BIOLOGICAL, AND AQUATIC SAMPLES. At. Absorption Newslett., 9(6):113-118, Nov.-Dec. 1970. 15 refs. (Presented at the Society for Applied Spectroscopy, Annual Meeting, 9th, New Orleans, La., Oct. 5-9, 1970.)

A quantitative procedure is described for determining submicrogram quantities of mercury in atmospheric, biological, and aquatic samples by atomic absorption spectrophotometry. In the analysis of biologic and water samples, organically bound mercury is oxidized with nitric acid, and all mercury present is reduced to the elemental state with stannous chloride. The liberated mercury is driven by an air current through specially impregnated charcoal for approximately two minutes. A glass tube packed with impregnated charcoal is used to take integrated atmospheric samples. A standard volume of 10 liters is sampled and the tube is capped and returned to the laboratory for analysis. All charcoal samples are analyzed directly for mercury with an atomic absorption sampling boat assembly. Measurement of the recorder peak height is used to determine the quantity of mercury present. The total analysis time is less than five minutes for aqueous samples, and the minimum detectable quantity of mercury is 0.02 microgram. After collection of mercury, the charcoal samples may be stored for later analysis. (Author abstract)

34815

Barnes, E. C.

THE DETERMINATION OF MERCURY IN AIR. J. Ind. Hyg. Toxicol., 28(6):257-261, Nov. 1946. 10 refs. (Presented at the American Industrial Hygiene Association, Annual Meeting, 9th, Chicago, Ill., April 9-11, 1946.)

The maximum allowable concentration of mercury has been established as one milligram per ten cubic meters of air. To determine quantitatively the concentration of mercury in air, the sampling procedure and analytical methods must be such that the sample is truly representative of actual working conditions at the location tested, and the quantity of mercury collected in less than one hour should be such that the analytical method employed will reveal, with a satisfactory degree of accuracy, quantities of mercury between approximately .03 and 10.0 mg per cu m of air. A method is described for the determination of the total mercury concentration in the air, whether present as dust or vapor. It employs the standard impinger for collection of the samples and a simple colorimetric analysis for the determination of mercury by a slight modification of the method of Polejaeff. A potassium iodide-iodine solution is used as the collection medium in the impinger.

34939

Gaynullina, E. T. and R. N. Nurmukhametov

POSSIBILITIES OF LUMINESCENT ANALYSIS OF INDUSTRIAL AIR POLLUTION. Zh. Vses. Khim. Obshchestva im. D. I. Mendeleeva, 15(5):506-513, Oct. 9, 1970. 72 refs. Translated from Russian in: Atmospheric studies at Chemical Enterprises - USSR, p. 53 -67, March 9, 1971. Joint Publications Research Service, Washington, D. C. NTIS: JPRS-52566

Organic compounds are distinguished by their luminescence properties. Some have both fluorescence and phosphorescence. These include aromatic condensed hydrocarbons and their derivatives. Others reveal only fluorescence, including many compounds with a chain structure used as luminescence additives in scintillators (polyphenyls, arylethylenes, aryloxazols, and arylxadiazols). The third group exhibits only phosphorescence (many aromatic aldehydes, ketones, quinones, and N-heterocyclic compounds). Brightly fluorescent compounds are easy to analyze by measuring their fluorescence (fluorimetry) and brightly phosphorescent compounds by their phosphorescence (phosphorimetry). Only the former is widespread in luminescent analysis, although the prospects for the latter are increasing. The dependence of luminescence on molecule structure is discussed and comparative data are presented on the sensitivity of luminescent and colorimetric analyses for a number of compounds for example, (benzanthrone, carcinogens, oil, beryllium, mercury, amines, acetylene, phosgene, hydrogen sulfide, mercaptans). The luminescent method has advantages in both sensitivity and speed: maximum optical density with the colorimetric method is achieved in 30-40 min while maximum glow intensity with the luminescent method is achieved in one to two minutes. Although most luminescent analyses are performed with laboratory instruments, automatic gas signal devices using luminescent and chemiluminescent reactions have been developed. Among the luminescent instruments are fluorescent devices for detecting toxic organophosphorus compounds and hydrogen sulfide.

D. AIR QUALITY MEASUREMENTS

04986

J. Cholak

THE NATURE OF ATMOSPHERIC POLLUTION IN A NUMBER OF INDUSTRIAL COMMUNITIES. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 6-15.

An expanded electrostatic precipitator sampling program for investigating certain more general characteristics of the air pollution of Cincinnati was resumed in 1946. Starting with twelve sampling sites, the program was gradually enlarged in scope during the period 1946-51 to include the measurement of a number of gaseous pollutants as well as determinations of the composition of the particulate matter suspended in the air. Various other pollutants were included in the investigation as facilities for collecting samples and techniques for their analysis were improved. During this same period opportunities presented themselves for the study of pollution problems of a number of other communities. Since these data, obtained by comparable methods, are of interest in showing the similarities and differences in the character of the atmospheric pollution of various communities, it is our purpose (1) to describe the nature of the air pollution of Cincinnati, (2) to compare the Cincinnati data with the findings obtained during the course of shorter studies in other communities, and (3) to amplify the picture with results of observations reported in the literature. In making such use of the data of other investigators the analytical approach has been given careful consideration in order to make certain that comparable data were being dealt with.

06671

Z. Z. Bruskin

EXPERIMENTAL STUDY OF WORKING CONDITIONS AND ATMOSPHERIC AIR POLLUTION WITH ETHYLMERCURIC CHLORIDE DURING TREATMENT OF CEREAL GRAINS IN THE OMSK OBLAST . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 264-71, 1962. (Gigiena Truda i Prof. Zabolevaniya,) i (5), 20-4 (1958). Russ. (Tr.) CFSTI: 62-11103

A study was undertaken to evaluate the health hazards involved in the application of ethylmercuric chloride (EMC) to cereal grains. Concentrations of EMC were measured in various working zones and in the open air at varying distances from the operation. The results of these measurements are tabulated; the effectiveness of a respirator is reported; and recommendations are made to improve the protection of the workers.

07649

Thillier Georges

DETERMINATION OF TRACES OF LEAD IN AIR BY ATOMIC ABSORPTION SPECTROMETRY. Anal. Chem., 39(4):427-432, April 1967. 6 refs.

Direct supply of air samples from the atmosphere to the burner of an atomic absorption spectrophotometer allows the rapid determination of certain elements such as lead. The method described has been in service in the tetraethyl-and tetramethyllead production installations of our Paimboeuf plant, since November 1965, with general satisfaction. It allows continuous monitoring of the lead concentration in the environments where the organic derivatives of this element are manufactured or handled. It permits the detection of slight leaks in the apparatus, and improves safety. The limit of detection is .000001 gm/cu m. The sensitivity and accuracy are of the same order as those of discontinuous methods, which require from some hours to a day per analysis. This method is also applicable to determination of other elements in air, particularly mercury. (Author's summary)

12065

Williston, S. H.

MERCURY IN THE ATMOSPHERE. J. Geophys. Res., 73(22):7051-7055, Nov. 15, 1968. 3 ref.

High-sensitivity mercury-vapor analysis has been automated to provide a continuous monitoring of Hg in the earth's atmosphere over the last 2-year period. In the San Francisco Bay area (Los Altos) winter concentrations range from slightly over 1/2 to 25 nanograms of Hg per cubic meter of air. Summer concentrations range from slightly over 1 to 50 nanograms per cubic meter. Concentration of Hg seems to depend primarily on wind direction, wind speed, and seasonal temperature variations. Numerous other variables also affect it. It is shown that high Hg levels always coincide with high smog levels. (Author's Abstract)

20790

Brar, S. S., D. M. Nelson, J. R. Kline, P. F. Gustafson, E. L. Kanabrocki, C. E. Moore, and D. M. Hattori

INSTRUMENTAL ANALYSIS FOR THE TRACE ELEMENTS PRESENT IN CHICAGO AREA SURFACE AIR. J. Geophys. Res., 75(15):2939-2945, May 20, 1970. 4 refs.

On April 4, 1968, surface air particulates were collected on cellulose fiber filters simultaneously at 22 different locations throughout the Chicago metropolitan area. A 1-sq cm portion of each filter was irradiated with thermal neutrons in a CP-5 research reactor. The neutron-induced nuclides were analyzed by gamma-ray spectrometry with 10.2 cm by 10.2 cm (4 in. by 4 in.) and 7.6 cm by 7.6 cm (3 in. by 3 in.) cylindrical NaI(Tl) crystals and a 400-channel analyzer. By varying the neutron flux and the time of irradiation, twenty trace elements in the surface air were detectable by purely instrumental means. The following elements, listed in decreasing order of concentration, were present: iron, chlorine, aluminum, zinc, manganese, sodium, bromine, vanadium, chromium, antimony, mercury, selenium, cerium, silver, cobalt, lanthanum, scandium, cesium, and europium. The average concentrations varied from 2400 to 0.12 mg/cu m air. Calcium concentrations in air were not quantitated. (Author abstract modified)

26557

ANNUAL REPORT OF PUBLIC HAZARDS. I. 1969. (Showa 44 nendo. Kogai no jokyo ni kansuru nenji hokoku. (I)). Text

in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 5(4):10942, 66, June 1970.

The present state of public hazards in Japan, with special referenc to water and air pollution, were reviewed. In some cities the degree of pollution remained high and there were areas where a tendency to increase was evident, and where urgent countermeasures were necessary. Since the enforcement of minimum standards for exhaust gases and promulgation of countermeasures in the form of low-sulfur fuel in 1969, some amelioration was observed in areas with a previous history of pollution by oxides of sulfur. In the case of precipitated soot and dust, there has been generally, if anything, a tendency for the amount to decrease over the past few years due to the installation of dust and soot collectors and the transition from coal to fuel oil. Recently, however, certain areas have again shown an apparent tendency to increase. A similar tendency was exhibited by suspended soot and dust. Oxidants which are produced by reaciton between sunlight and the oxides of nitroge released into the air following the combustion of hydrocarbons in automobiles stimulate the eyes by a complicated mechanism and are also harmful to plants. The remarkably high levels of water pollution in recent years were noted, together with their effect on the nation's health, the environment, and certain industries. With regard to health factors, the Minamata and Itai-itai syndromes were reported. The former was caused by the accumulation of methyl mercury through the consumption of affected fish, and the latter by cadmium in the effluent from mines. With regard to the other factors, water pollution, including that of city drinking-water supplies, industrial water supplies, and agricultural water supplie involving corrosion of the outer hulls of vessels and jetties were reported. Effects on the public health factors of the environments of cities and the decrease in visibility in cities were also noted.

27188

Iki, Sadao, Shunichi Yoshinaga, Tanetomo Nishimura, and Masaru Matsumoto

THE CONTENTS OF HEAVY METALS IN THE ATMOSPHERIC DEPOSITS IN KITAKYUSHU CITY. (Kitakyushushi niokeru koka haijin chuno kinzok seibun nitsuite). Text in Japanese. Kyushu Sangyo Daigaku Kogakubu Kenkyu Hokoku (Kyushu Ind. Coll. Res. Rept.), vol. 7:1-26, June 1970. 4 refs.

Quantitative analysis of heavy metals contained in atmospheric deposits was performed in February, October, and December, 1968, at 30 locations distributed in Kitakyushu city. Manganese, zinc, nickel, cobalt copper, chromium, cadmium, and lead analyzed by atomic ansorption, first by way of total burner consumption and later by laminar flow burner. The atmospheric deposit contained a large amount of Zn, Pb, titanium, and Mn (2534-1434 ppm), medium quantity of Cu, vanadium, and Cr (448-240 ppm), and a little Ni, Co, and Cd (66.9-8.9 ppm). The solubility of the metals, the ratio of the amount dissolved to total was large for Cu, Zn, and Mn (64.05-26.17%), small for Ni and Pb (1.10-1.05%), and nearly zero for Ti, Co, Cr, V, and Cd. The proportion of the metal components in the deposit varied from ward to ward, but differed very little among industrial, commercial or residential areas. On the average, coal ashes contained a large amount of Ti. Petroleum ashes contained an especially large amount of V, Zn, Ni, and Cu. Since neither coal nor petroleum ashes contain Mn or Pb, these metals in the deposit were considered to come mainly from plants and automobiles. The fact that the petroleum ashes contained a much larger quantity of metals, except Ti, than the coal indicated the future increase of metal contents with the changeover to petroleum from coal. In the future, dusts will be collected from other sources, and tin, beryllium, arsenic, and mercury will also be determined.

29490

MERCURY IN THE AIR. Environment, 13(4):24, 29-33, May 1971. 9 refs.

An airborne survey has revealed that coal-burning power plants, municipal incinerators, and several industrial plants are emitting large quantities of mercury vapor. Measurements were made of air taken from the plumes discharged from smokestacks with the Barringer mercury spectrometer mounted on a helicopter. Calculations were then made to estimate the total quantities of mercury vapor being emitted from these sources. Eight power plants accounted for a total of 8700 pounds per year of mercury emitted into the atmosphere, while the four incinerators emitted an estimated total of 12770 pounds per year.

29545

King, E.

INTERPRETATION OF RESULTS OF EXAMINATION OF AIR. (Interpretations des resultats de prelevements d atmosphere). Text in French. Lab. Central des Services Chimiques de I. Etat, Paris (France) and Inst. National de Securite pour la Prevention des Accidents du Travail et des Maladies Professionnelles, Paris (France), Colloq. Securite Sociale Serv. Prevent., 3rd, Paris, France, 1955, p. 27-33. 7 refs. (Nov. 3-5.)

Caution is required in interpreting individual readings of pollutant concentrations in manufacturing shops. Three graphs represent variations in the atmospheric mercury vapor concentration measured between 10 am and 5 pm in a repair shop where small quantities of mercury are used. In the first case, small concentrations were recorded up to 2 pm, apparently due to little repair work being done. In the afternoon the concentration of the pollutant rose to a peak value of 400 micrograms of mercury per cu m of air, compared to an average of 100 micrograms in the morning. A second case under comparable conditions, shows the effect of opening and closing a small window. The third case reflects the conditions in a similar shop, equipped with force air ventilation, where Hg pollution unexpectedly occurred at higher rates than with plain window ventilation. In another case involving chronic intoxication by cadmium in a shop which produces a copper-cadmium alloy, the relative skill of the furnace operator was responsible for variations in the atmospheric concentration of cadmium oxide. The emission of fumes from the furnace was usually restricted to about 10 minutes per hour. A thermal precipitator was used, supplemented by apparatus with a soluble filter for finding the average dust concentration per shift. Another device for continuous recording incorporates a filter paper band transported at constant speed under an orifice through which the air streams and then passes through the filter. Subsequent visual inspection of the filter permits the approximate interpretation of the relative variations as a function of the time of the day and of the workers activities.

30511

Thompson, Jack E.

HAZARDS OF MERCURY: AIRBORNE MERCURY. Environ. Res., 4(1):50-53, March 1971.

Very little is known about the quantitative or qualitative aspects of mercury in the atmosphere, since only a few measurements have been made of mercury concentrations in the

air. Mercury may occur as a vapor, an aerosol, or both; it may also be present in the organic or inorganic form. The mercury levels found in fish from several lakes in Sweden and Finland were relatively high, with no known industrial discharges into the lakes. It was, therefore, assumed that the mercury comes primarily from the atmosphere. A partial model of the movement of mercury among the air, soil, and water components of the environment is presented The levels of atmospheric mercury in the United States, which have been observed from limited ambient air sampling, are below the threshold limit values of 0.1 mg/cu m for metallic vapor and inorganic compounds and 0.01 mg/cu m for organic mercury. It is recommended that the chemical and physical forms of mercury in the air be determined. The quantitative and qualitative transformation aspects of mercury and its compounds should also be determined. Studies should be made on the amount of mercury emitted to the air from soil, water, vegetation, and manmade sources.

31112

Mayz, Eusebio, Morton Corn, and Gene Barry

DETERMINATIONS OF MERCURY IN AIR AT UNIVERSITY FACILITIES. Am. Ind. Hyg. Assoc. J., 32(6):373-377, June 1971. 20 refs.

A Beckman Model K-23 mercury vapor meter was modified to include a charcoal trap to remove interfering organic vapors and a membrane filter to remove aerosols. During sampling of an unknown atmosphere, the sample bypassed the filters and entered an optical absorption cell which replaced the more common external grill supplied with the standard instrument. The modified instrument was used to measure mercury in air concentrations at sites within a large university complex. General air concentrations were found to be in the range 0.010 to 0.035 mg/cu m; several breathing zone areas were associated with concentrations in excess of the recommended threshold limit value of 0.05 mg/cu m. Educational and surveillance programs are urged to minimize the risk assumed by personnel using mercury. (Author abstract modified)

31371

Japan Environmental Sanitation Center, Tokyo

REPORT OF A SURVEY ON ENVIRONMENTAL QUALITY IN THE DISTRICTS UNDER POLLUTION CONTROL PROGRAM. (Kogai boshi keikaku sakutei chiiki kankyo chosa hokokusho). Text in Japanese. 136p., March 1969.

Air pollution, water pollution, offensive odors, and noise in the Chiba/Ichihara, Yokkaichi, and Mizushima districts were surveyed in 1968. Average daily sulfur dioxide concentrations were 0.02 ppm in the Chiba/Ichihara district and 0.01-0.05 ppm in the Yokkaichi district. Values measured at 28 points in the latter district varied according to direction, wind velocity, and geographical conditions. The mean value of suspended dusts in the Chiba/Ichihara district was 151.6 microgram/cu m, but values as high as 256-1649 microgram/cu m were measured in Yokkaichi. Here iron contents of 105.8 microgram/cu m and 334.0 microgram/cu m were found. Organic sulfur compounds such as dimethyl sulfide (1.0 ppb) and isoprophyl mercaptan (3.5 ppb) were also detected in Yokkaichi City. Nitrogen oxides and hydrogen chloride values in th Chiba/Ichihara district were 0.003-0.025 ppm and 0.01-0.06 ppm, respectively. Fluorine compounds were not detected. Maximum chlorine, formaldehyde, and hydrogen sulfide concentrations of 0.07, 0.057, and 0.005 ppm, respectively, were measured in the summer. In the Mizushima district, two methods were applied to determine offensive odors from petroleum complexes: odorimetry and gas chromatography. With the latter measuring 0.006-0.012 ppm of ethyl acetate. The gas was irritative with a sour and sweet odor. Biological oxygen demand measurements and analysis of bottom soil in Yokkaichi harbor, and 0.20-1.28 milligram/dry kg of mercury in bottom soil of the drainage at a chemical factory in the Mizushima district. Noise levels in residential areas were below or only a little higher than the standard, but noise levels along heavily travelled roads were significantly high.

32912

Kanagawa Prefectural Government (Japan)

KANAGAWA PREFECTURAL AIR POLLUTIONS SURVEY AND RESEARCH REPORT. (Kanagawa-ken taiki osen chosa kenkyu hokoku). Text in Japanese. Rept. 13, 109p., Feb. 1971. 49 refs.

Reports were compiled on surveys conducted in Kanagawa Prefecture. Atmospheric concentrations of dust, sulfur dioxide, nitrogen dioxide, carbon monoxide, carbon dioxide, lead, chlorine, sulfur trioxide, nitrogen oxides, and automobile exhaust gases were measured. Air pollution and meteorological conditions in the Tokyo-Yokohama industrial belt, and effects of air pollution on humans and trees were also studied. Enforcement procedures based on the Air Pollution Control Law are examined. Air pollution forecasting and some examples of control methods are discussed. Research reports on mercury determination by the atom light absorbing method, nitrogen oxides measurement, gas sampling, and measuring carbon monoxide by detection tubes are included.

E. ATMOSPHERIC INTERACTION

23744

Massachusetts Inst. of Tech., Cambridge

STUDY OF CRITICAL ENVIRONMENTAL PROBLEMS (SCEP). SUMMARY OF MAJOR FINDINGS AND RECOMMENDATIONS. Preprint, 17p., July 31, 1970.

The results of a study of environmental problems the cumulative effects of which are so large and prevalent on ecological systems that they have world-wide significance are reported. Of primary concern are the indirect effects of pollution on man through changes in climate, ocean ecology, or in large terrestrial ecosystems. Several specific problems are considered, and recommendations to solve them are given. The combustion of fossil fuels increases the total supply of carbon dioxide. Direct climate change in this century resulting from CO2 is small, but the long term potential consequences are grave. Particulates in the atmosphere change the heat balance of the earth. These particles can be released naturally or from man-made sources. The effects of jet planes in the stratosphere, particularly in terms of cloud formation and temperature rise, are discussed. The effects of toxic pesticides on crops and complex ecosystems are studied. The concentration of these pesticides in marine organisms is a very serious problem. Mercury and other toxic heavy metals enter the environment through industrial processes and biocides. The effects of oil spills on the ocean are discussed. The eutrophication of waters through extensive use of nitrogen and phosphorus fertilizers leads to oxygen depletion and fish-kills. The amelioration of the massive environmental problems that exist depends upon social and political changes in the society.

23809

Wheeler, Fred

THE GLOBAL VILLAGE PUMP. New Scientist, 48(721):10-13, Oct. 1, 1970.

During July 1970, some 40 scientists from all the relevant disciplines and about 60 part-time advisers and consultants were at Williams College in Massachusetts reviewing all the literature and statistics that could be gathered concerning pollution and the changing environment. The Study of Critical Environmental Problems (SCEP) had the job of deciding which pollution effects are indeed global, what measurements and research are needed to repair the gaps in our understanding of these global effects, and to provide some guidance as to what kind of practical action may be needed. Global ecological influences were DDT and other toxic persistent pesticides, mercury and other toxic heavy metals, oceanic oil pollution, and excessive nutrients in rivers, estuaries and coastal waters in general. At the beginning of the industrial revolution, the carbon dioxide content of the atmosphere was probably about 280 parts per million, while it is now 321 ppm and rising at an annual rate of 0.7 ppm. SCEP recommendations include systematic study of the partition of CO2 between the atmosphere and oceans and the biomass, study of changes in the total mass of living matter an decaying products, and improvements in our estimates of future fossil-fuel burning. Climatic effects of carbon dioxide are discussed, as well as the particulate interference from the emission of sulfur dioxide in the combustion of fossil fuels. If atmospheric CO2 rises, less heat escapes from the earth and the overall temperature rises, while the small particles of SO2 absorb as well as scatter the incoming solar radiation. SCEP encourages the development of computer models of the atmosphere, as well as the study of the optics of small particles and their transport. More needs to be known about the stratosphere, particularly in the event of supersonic transport. Ecosystems are mentioned and the identification of potential global pollutants.

26697

Jenne, E. A.

ATMOSPHERIC AND FLUVIAL TRANSPORT OF MERCURY. In: Mercury in the Environment. Geological Survey, Washington, D. C., Profess. Paper 713, p. 40-45, 1970. 31 refs.

Near-surface mercury-bearing mineral deposits, industrial wastes and exhausts, and applications of agricultural chemicals serve locally to increase the mercury of levels of streams, lakes, and impoundments. Mobility of mercury is greatly enhanced by a property which is unique among the metals, namely the relatively high vapor pressure of the metallic state and, to a lesser extent, certain of its compounds. The saturation level of mercury in air in equilibrium with metallic mercury increases logarithmically with increasing temperature. The high degree of undersaturation of the soil air directly over a mercury deposit probably represents the faster rate of exchange of soil air with atmospheric air as compared to the rate of evaporation of mercury and its volatile compounds. Oxidation of mercury-bearing sulfide ores presumably results in the formation of both mercuric and mercurous ions. Rainfall and leaching convey a part of the atmospheric mercury to streams and other waters. Mercury appears to be strongly sorbed by soils and sediments, for which various indications are cited. Less rapid reactions that may remove mercury from water and soil solutions are the possible isomorphous substitution for barium and, to a lesser extent, for calcium. Little information is available on the cation exchange properties of mercury. At trace concentrations, mercury is rapidly taken up by micro-crystalline oxides, peat moss, and soils. Solute mercury introduced into streams is quickly transformed to the particulate form by reduction to metallic mercury, by sorption on the inorganic sorbates, by complexation with nonviable particulate organics, and by sorption and ingestion by viable biota. Pollution of waters is mentioned.

28465

Massachusetts Inst. of Tech., Cambridge

SUMMARY OF FINDINGS AND RECOMMENDATIONS. In: Man's Impact on the Global Environment. Cambridge, Colonial Press, 1970, p. 3-36.

The findings and recommendations of a number of month-long study/discussion work groups held at Williams College, Williamstown, Mass. in 1970 are presented for a series of problems concerned with the indirect effects of pollution on man through changes in climate, ocean ecology, or in large terrestrial ecosystems. The global environmental problems stu-

died were: climatic effects of increasing atmospheric carbon dioxide, of the atmospheric particle load, and of tropospheric and stratospheric contamination by sub- and super-sonic aircraft; the ecologic effects of nutrients in estuaries, lakes, and rivers; and the ecologic effects of petroleum in the oceans, of DDT and other toxic persistent pesticides, and of mercury and other toxic heavy metals. The recommendations emphasize the need to gather more information about pollution of the planet in order to understand the impact of man's activities and to make possible reliable projections of future conditions as a basis for remedial action. Global problems do not necessarily require global solutions, and most corrective action will probably have to be taken at the national, regional, and local levels, but societal values will need to be reassessed in any attempt to resolve the conflict between economic activity and its environmental effects.

F. BASIC SCIENCE AND TECHNOLOGY

06648

Matsak, V. G.

VAPOR TENSION AND VAPORIZATION OF SUBSTANCES IN MOVING AIR. Gigiena i Sanit., (8) 35-41, 1958. In: U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Translated from Russian by B. S. Levine, Vol. 8, 1-9, 1962 CFSTI: 62-11103

The purpose was to place at the disposal of engineers and hygienists working in the field of sanitary technology basic data regarding vapor tension and rate of vaporization of different inorganic and organic substances in moving air. Particular emphasis was placed on substances, and especially toxic substances, most commonly used in industrial technology. Such information should allow hygienists to evaluate the potential danger associated with vaporization of toxic substances in relation to their physico-chemical and toxicological properties, and sanitary engineers to apply it in their computation of air ventilation in general and of quantative determination of the degree of air charged with vapor of high-molecular substances, and in correctly distributing incoming and exhaust air, and in computing other means required for the sanitary improvement of labor conditions. It is suggested that sanitary engineers use the nomograms presented especially where a 5% error is permissible. More than 85 chemically pure substances are represented in three nomograms and two tables.

09764

Altman, Philip L. and Dorothy S. Dittmer (comps. and eds.)

ATMOSPHERE AND POLLUTANTS. (CHAPTER V.) In: Environmental Biology, Aerospace Medical Research Labs. (6570th), Wright- Patterson AFB, Ohio, Contract AF33(615)-2252, NIH-GM-06553, NASA- NASr-238, Proj. 7164, Task 716406, AMRL-TR-66-194, p. 269-329, Nov. 1966. (300) refs.

Numerical data on air pollutants are compiled and tabulated for a broad range of problems. The effects of pollutants on human health, plants and livesotck are presented. Characteristics and chemical composition of the atmosphere and its pollutants are compiled. Data on emission sources of pollutants and their distribution at various periods of time in different locales are presented. Other categories covered are air dispersion of small organisms, biological effects of gaseous ions, and spacecraft and nuclear submarine atmospheres.

10866T

Reutov, O. A. and U. Yan-Tsei

ISOTOPIC EXCHANGE OF SOME MERCURY ORGANIC SALTS WITH METALLIC MERCURY MARKED WITH Hg^{203}. Translated from Russian. Dokl. Akad. Nauk SSSR, 117(6):1003-1006, 1957.

The interaction was studied between metallic mercury labeled with the isotope Hg203 and the following organic mercury compounds: x-bromo-mercury-cyclohexanon, the ethyl ester of delta-bromo-mercury-phenylacetic acid, the methyl ester of delta-bromo-mercury-phenyl acetic acid, 3-bromo-mercury-3-benzyl camphor, 3-bromo-mercury-camphor, 1-chloro-mercury-camphene, 2-bromo-mercury-camphagne and n-butyl-mercury bromide. The reactions were carried out under identical conditions. The isotope exchange reaction was found to take place by direct action of metallic mercury on the mercury compound without the formation of free radicals. Isotope exchange occurs under mild conditions without decomposition of the mercury compounds and formation of radicals. Isotope exchange occurred also without change in the stereochemical configuration.

11570

Kosmider, S.

RELATIONSHIP BETWEEN HEAVY METAL POISONING, ATHEROMATOSIS, AND HEART AND CIRCULATORY DISORDERS. ((Zusammenhange zwischen Schwermetallvergiftungen und Atheromatose bsw. Herz-und Kreislaufstorungen.)) Text in German. Z. Ges. Hyg. 14(5):355-360, May 1968. 12 refs.

Experimental lead poisoning in dogs induced electrocardiographic disorders (changes in repolarization) and histopathological alterations of the heart muscle. The clinical study of 108 patients with chronic lead toxicity (no details as to occupation) revealed that vagotonia prevailed mainly in younger subjects (22 of 60 patients between 18 and 45 years old) while older individuals (14 of 48 between 46 and 65 years old) had alterations of the heart muscle. Phonocardiography revealed that heart murmurs not connected to anemia but to the injury of the heart muscle. Experimental mercury poisoning in dogs was responsible for high levels of cholesterol and beta-lipoproteins in the serum, as well as for increased mucopolysaccharides in the aortic wall.

13197

Kleinfeld, Morris, Edward Stein, and Dolores Aguillardo

DIVALENT CATIONS ON ACTION POTENTIALS OF DOG HEART. Am. J. Physiol., 211(6):1438-1442, 1966. 10 refs.

The effects of Mn, Ni, Hg, Cd, Cu, Zn, Sr, and Mg on transmembrane action potentials of Purkinje and ventricular muscle fibers on dog heart were studied. The concentrations of cations administered varied between 0.001 and 0.00001 M. All except magnesium altered the action potential of both fibers. Only Hg produced a marked alteration of action potential of Purkinje fiber with little change in ventricular fiber action potential. The most consistent alteration produced by the divalent cations was either a shortening or lengthening of plateau phase of action potentials of both fibers. Nickel and Mn lengthened the plateau phase, whereas Cu, Hg, Zn, Cd, and Sr shortened it. Copper, Hg, Zn, and Cd produced a greater degree of shortening of duration of action potential in Purkinje than in ventricular fiber. These four cations have an affinity for binding sulfhydryl groups, and the greater modifying effect on the Purkinje fiber produced by these four cations suggests that this fiber may be more sulfhydryl-dependent than ventricular fiber. The lengthening of plateau phase can be ascribed to a decrease in potassium conductance, and the shortening of the plateau phase can be attributed to an increase in K conductance. Changes in Ca conductance may also be im-

plicated in plateau phase-a decrease in Ca conductance being associated with a shortening and an increase in Ca conductance with a lengthening of plateau phase. (Author abstract modified)

13348

Leach, S. J.

THE REACTION OF THIOL AND DISULPHIDE GROUPS WITH MERCURIC CHLORIDE AND METHYLMERCURIC IODINE. I. SIMPLE THIOLS AND SOLUBLE PROTEINS. Australian J. Chem., 13(4):520-546, Nov. 1966. 45 refs.

The polarographic behaviour of MeHgCl, (me = methyl), MeHgI, HgCl2, neohydrin (3-chloromercuri-2-methoxypropylurea) and its iodo-derivative are described. Their chemical reactivity and -SH specifieity were investigated and MeHgI was shown to have advantages as an -SH reagent on account of its high reactivity, stability, and 'ideal' polarographic behaviour. The reaction of protein -SS- groups with Na2SO3 proceeds slowly to completion in the presence of HgCl2 or MeHgI and it is shown that with bovine plasma albumin, ribonuclease, and insulin the polypeptide chains may be separated for preparative or structural studies under milder conditions than are customary. In the presence of urea at pH 9 the reaction is sufficiently rapid to form the basis of amperometric titration procedures for determining -SS- groups in eight intact proteins. The methods are especially valuable for proteins which have been previously converted to their -SR, -SO3(-), or -SSO3(-) derivatives since the destructive hydrolytic step may be avoided. The mechanism and stoichiometry of the reactions are discussed. (Author summary modified)

14712

Nelson, G. O.

A SIMPLIFIED METHOD FOR GENERATING KNOWN CONCENTRATIONS OF MERCURY VAPOR IN AIR. In: Hazards Control Progress Report No. 33 (Januar April 1969), California Univ., Livermore, Lawrence Radiation Lab., UCRL-50007-69-1, p. 35-38, 1969.

A compact apparatus which would require a minimum of specialized equipment but which would still provide a desirable accuracy for the production of mercury vapor in air was designed. The compressed air passes through indicating silica gel, soda lime, and a charcoal filter to remove any impurities. The purified air stream splits into two lines; one line is used as the dilution air and the other flows into a saturation unit. The saturated and diluted air are mixed. The desired concentration is achieved by adjusting the flow rates of air and mercury-saturated air at the measurement temperature. Accurate measurement of the temperature is the most crucial part of the calibration operation. The mercury vapor generator occupies only about 1 sq ft of bench space and yields concentrations from 0.011 to 2.5 mg/cu m at flow rates of 6 l/min or more. Other concentration ranges can be achieved if different flowmeters are substituted for those suggested. Concentration changes are made simply and easily by adjusting the needle valves. Equilibrium is reached almost instantaneously, since there is no large mixing flask to equilibrate.

15266

Rozenberg, Jean

PHOTOCHEMICAL SEPARATION OF ISOTOPES. Isotop. Radiat. Technol., 3(3):200-205, Spring 1966. 57 refs.

Experiments in the photochemical separation of isotopes are reviewed, and the technique is shown to be especially applicable to mercury isotopes. Good separation requires that the bands in the absorption spectrum of the element be widely separated and that the product enriched by photoselective reaction not be contaminated by secondary reactions. Separation of mercury isotopes is a well-developed procedure and is about to become industrial. Lithium isotopes should theoretically be separable by such a technique, but handling of molten lithium is difficult. The failure of the first attempts to separate chlorine and uranium isotopes is probably due to misjudgment of the primary mechanisms and to the use of too simple techniques. Hydrogen isotopes may be separated with light sources with H (or D) alpha Lyman sources, but yields are too low for large-scale use. (Author abstract modified)

22567

Whiteman, J. L.

ADSORPTION AND SORPTION COMPLEXES FINAL TECHNICAL REPORT. Imperial Coll. of Science and Technology, London (England), Contract DA-91-591-EUC-2465, 24p., June 1963. 5 refs. CFSTI: N63-23425

A study of the inclusion complexes formed by sulfur, phosphorus, and mercury in a number of zeolites is reported. The sorbents are regarded as continuous frameworks built by stacking together cages of various types. One such cage is the cubo-octahedron which has 14 faces; six are made from rings of four (Al,Si)04 tetrahedra and the remaining eight from rings of six such tetrahedra. Another structure-building unit is the hexagonal prism. In chabazite and gmelinite the anionic frameworks can be represented as sequences of layers of hexagonal prisms. Sulfur vapor adsorbed rapidly by the zeolites CaA and NaX. The uptake of the large cages in these zeolites is only about 75% of that expected from their volmes. This may be attributed to steric difficulties encountered in packing large molecules into the cages. The sulfur uptake of natural chabazite is comparatively slow and limited in extent. Phosphorus is also strongly adsorbed by NaX, but the approach to equilibrium is slow. Studies have been conducted on the mercury uptake of silver ion-exchanged zeolites. Large uptakes were recorded for the zeolites with the more open structures, and hysterisis loops were obtained. The saturation uptake of mercury is insufficient to completely fill the structure.

32072

Roesmer, J. and P. Kruger

THE RADIOCHEMISTRY OF MERCURY. Washington, D. C., National Academy of Sciences National Research Council, Dec. 1960, 50p. 85 refs.

The radiochemistry of mercury is reviewed with respect to the isotopes of mercury; special attention is given to features of chief interest to radiochemists, including metallic mercury, mercury compounds, toxicity, insoluble compounds, coprecipitation and exchange characteristics, complex ions, organic precipitants, solvent extraction of mercury, ion exchange behavior, paper chromatographic behavior, and activation, and vaporization analysis. The dissolution of mercury compounds and counting techniques for mercury are discussed. A collection of detailed radiochemical procedures for mercury are presented.

G. EFFECTS-HUMAN HEALTH

05185

K. Kiryakov

CHANGES IN THE CEREBRAL BIOELECTRICAL ACTIVITY IN WORKERS FROM THE EFFECT OF MERCURY. Gigiyena Truda i Professional'nyye Zabolevaniya. 60-4, 1963. Russ. (Tr.)

The effect of mercurial vapors can bring about certain changes in the cerebral cortical bioelectrical activity expressed chiefly in low voltage and incomplete or partially dominant desynchronization (fast rhythm). These changes are related to the duration of industrial contact with mercury. In persons who were healthy for practical purposes, in the majority of cases, the electroencephalograph pattern showed no changes; the EEG changes in some persons who were healthy for practical purposes can constitute the EEG method should be used simultaneously with other clinical and laboratory methods for purposes of early diagnosis of mercurial neurointoxications.

05470

Y. Ohta

ACTIVATION ANALYSIS APPLIED TO TOXICOLOGY; MEASUREMENT OF THE CONCENTRATION OF MERCURY IN HAIR BY NEUTRON ACTIVATION ANALYSIS. Japan. J. Ind. Health (Tokyo) 8, (5) 12-5, May 1966. Jap.

A determination was made of the concentration of mercury in head hair of a man suspected to have been exposed to mercury vapors and to have inhaled some. About 100 mg of hair, cut to equal lengths and at the same distance from the scalp at the part of the head every month for seven months, was washed to remove surface contamination. After neutron irradiation of the sample in an HTR reactor for 5 hr in a thermal neutron flux of about 1 x 10 to the 12th power n/sq cm/sec, followed by cooling for 5 days, mercury was determined by direct gamma-ray spectrometry. Results from the hair samples showed that the concentration of mercury decreased monotonically from 20 4 ppm to 4.6 ppm. Results from samples taken from other workers who had not inhaled mercury vapor were significant in that the concentration of mercury found was only from 1.9 to 6.2 ppm. Non-destructive activation analysis of head hair enables more cases to be dealt with in a shorter time. The detectable limit is 0.08 plus or minus 0.02 microgram using a minimum quantity of hair below 50 mg. (Authors' summary, modified)

05737

Mastromatteo, E.

RECENT OCCUPATIONAL HEALTH EXPERIENCES IN ONTARIO. J. Occupational Med. (Ottawa). (Presented at the American Industrial Health Conference, Bal Harbour, Fla., Apr. 1965.). 7(10):502-511, Oct. 1965.

Industrial exposure to several toxic agents is reveiwed and case histories are given. Included are mercury exposure in chlor-alkali plants, electrical outdoor advertising, the hat industry, and the treating of grain seed with an organic mercurial fungicide; asbestos insulation and the manufacture of brake linings and clutch faces; exposure to toluene didiisocyanate and a curing agent for isocyanate-containing polymers; furfuryl alcohol exposure; illness associated with urethane foam manufacture; and respiratory sensitization in a rubber industry.

05945

Kurnosov, V. M.

SUPPLEMENTAL DATA ON THE ACCUMULATION AND DISTRIBUTION OF MERCURY IN THE ORGANISM OF EXPERIMENTAL ANIMALS. (In: Limits of allowabl concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp.47-54. (1962). Russ. (Tr.) Levine, B. S. 'Translator'

Chronic experiments were conducted for the determination of the effect of 0.002-0.005 mg/cu m mercury vapor on the organism. Chronic exposure to the effect of mercury vapor in concentrations at times found in atmospheric air adversely affected the organism by disturbing the functional activity of higher nervous centers, by excessive deposition of mercury in the organs and especially in the brain, and by producing pathomorphological changes. The extent and gravity of the neurological and pathomorphological changes were directly proportional to the mercury vapor concentration in the inhaled air. Experimental exposure of animals to the inhalation of mercury vapor in concentrations below the limit of allowable concentration in atmospheric air elicited none of the above described pathological symptoms. This confirms the conclusion previously arrived at, namely, that 0.0003 mg/cu m of mercury vapor should be regarded as the limit of its allowable concentration in atmospheric air. Results of the present investigation showed that chronic exposure to mercury vapor in concentrations of 0.008-0.01 mg/cu m, resulted in the deposition of mercury in organs and brain tissues, which disturbed the higher central nervous activity centers and other organs, accompanied by patho-morphological changes. Therefore, it is suggested that the existing limit of allowable mercury vapor concentration for air of working premises is ill founded and should be revised after appropriate investigation.

06172

Clarkson, T.

TOXICOLOGICAL ASPECTS. Ann. Occupational Hyg. (London) 8 (1), 73-80 (Mar. 1965). (Presented at the 16th Conference, British Occupational Hygiene Society, Apr. 7-8, 1964.)

A discussion of one new technique which is finding increasing application to the toxicology of mercury and which has already revealed some unusual biological properties of the compound is presented. Thetechnique is radioisotopic, in particular the isotope known as Hg203. In order to produce toxic effects, metallic mercury vapor, after absorption into the animal, must first be oxidized to the ionic form. The finding that the distribution and excretion of mercury is similar after injections of HgC12 or exposure to mercury vapour indicates that the oxidation of the metal is rapid and probably takes place in the blood. To check this conclusion, samples of whole heparinized

human blood were equilibrated with radioactive mercury vapour in vitro. After 25 hr equilibration in air, 25 micrograms Hg were present per ml of haemoglobin solution. The unique feature of this experiment was the behavior of the radioisotope. The mercury, originally present as mercuric ion strongly bound to hemoglobin, had been converted to mercury vapour and as such, had diffused out of the solution into the air space and finally collected in the liquid metallic phase. Other electron donors (reducing agents) present in animal tissue may be capable of converting the salt to the metal and thereby leading to loss from the tissue by volatilization. The significance of this point was not appreciated until further results were obtained from completely different experiments. These results give rise to a variety of questions concerning the mechanism whereby micro-organisms are able to volatilize mercury. We might also speculate that those micro-organisms which are resistant to mercuric chloride are those which are capable of volatilizing the metal. These questions must be left for future investigation. Of immediate practical importance is the ability of various micro-organisms to produce rapid volatilization from sample of urine. Clearly much more care must be taken in the collection and storage of urine samples prior to measurement of mercury.

06176

Kazantzis, G.

CHRONIC MERCURY POISONING-CLINICAL ASPECTS. Ann. Occupational Hyg. (London) 8 (1), 65-71 (Mar. 1965). (Presented at the 16th Conference, British Occupational Hygiene Society, April 7-8, 1964.)

Chronic mercury poisoning, common in the past, still occurs today and the diagnosis even in those exposed in industry can be missed. Three cases of poisoning from a group of five workers exposed to mercury working in a firm making electrical apparatus showed between them the classical features of the disease. All had high values for urinary excretion of mercury and one worker had transient proteinuria which cleared as mercury excretion fell. Investigation showed the proteinuria to resemble that found in glomerular lesions of the kidney but no other functional abnormality was detected. All workers exposed to mercury should be kept under medical surveillance and regular examination of the urine should be performed. Those who develop proteinuria, as well as those with mercurialism, should be removed from further exposure until full recovery occurs.

06239

Kudsk, F. N.

CHEMICAL DETERMINATION OF MERCURY IN AIR (AN IMPROVED DITHIZONE METHOD FOR DETERMINATION OF MERCURY AND MERCURY COMPOUNDS). Scand. J. Clin. Lab. Invest., 16:1-15, 1964.

In an introduction the prophylactic and diagnostic importance of knowledge of the mercury content of the air are described. The present disagreement of the establishment of toxic thresholds for this metal and its compounds is emphasized. After a brief description of some of the most frequently used methods for estimating mercury in the air, an improved apparatus for the rapid collection of mercury from the air in 10 ml sulphuric acid- potassium permanganate solution is described. The treatment of the absorption solution before the determination of mercury is discussed, and a modified method suggested. Two methods of estimating the mercury collection are described. By one method, which can be used 'in the field', the mercury is estimated with rather low accuracy by an extraction titration with a solution of dithizone in chloroform. The other more accurate and more sensitive method is based on a spectrophotometric estimation using dithizone. A method which can be used in the presence of up to 20 mg copper is described. (Author summary)

06617

V. V. Sokolovskiy

CONCERNING THE HEMOLYTIC ACTION OF THIOL POISONS. Tsitologiya (Cytology) (4), 460-5 (1962). Russ. (Tr.) DDC: AD 400 415

For a more complete illumination of questions concerning the ability of thiol poisons to cause destruction of erythrocytes, and for the relation of destructive changes in cells through inactivation of their SH-groups, the hemolytic action of specimens of all three types of thiol poisons, i.e. oxidizing (sodium nitrite), alkylating (monoiodo-acetic acid), and mercaptide-forming (mercuric chloride) agents were studied. Thiol poisons of the mercaptide-forming, oxidizing and alkylating types produce hemolysis of erythrocytes in in vitro experiments. Hemolytic action by oxidizers can be prevented by thiol substances (2.3 dimercaptopropane sodium sulfonate). An essential role in the preservation of the spatial structures of erythrocytes belongs to their sulfhydryl groups.

06680

Hervy B. Elkins

EXCRETORY AND BIOLOGIC THRESHOLD LIMITS. Am. Ind. Hyg. Assoc. J., 28(4):305-314, July-Aug. 1967. 27 refs.

'The Industrial Hygienist today recognizes that the peril incurred by the inhalation of harmful dust is a function of two variable factors - the degree of harmful exposure and the specific susceptibility of the exposed individual to ... injury.' The preceding statement was made by Don Cummings in a paper published in 1938. The following year he repeated a suggestion he had discussed previously. '...It is also suggested that for each hazardous industrial dust two limiting concentrations should be established. The first, to be designated as the primary threshold, should express that concentration of dust in which a healthy man may be employed for a working lifetime without incurring a disabling injury. The second, to be designated as the secondary threshold, should express that concentration of dust in which a healthy man will inevitably contract silicosis if regularly employed for many years.' Practically all industrial hygienists presently pay lip service to the principle stated in the first of these statements. The suggestion in the second statement has been only half adopted. Threshold limits, so-called, or under a different name, have been prepared for over 400 industrial hazards by various organizations in this country and abroad. There seems to be some confusion outside, if not within, the profession, however, over whether these values correspond to the primary or secondary limits. Certainly, when the observation that one or two workers can endure concentrations well above the Threshold Limit Value for a few months, without obvious ill effects, leads to the conclusion that the threshold limit is too low, it would seem that the observer has the secondary threshold in mind, rather than the primary one. The only biologic fluid finding much application for exposure tests is blood; limited use has been made of biopsy specimens of lung, skin and fat, but these are not very practical for periodic sampling. The excretory products most frequently analyzed are urine and breath; sweat, the other major excretion product, is not well adapted for exposure tests.

07234

Kosmider, S., D. Habczynska, and C. Wazna-Bogunska

MORPHOLOGIC LESIONS IN THE KIDNEYS IN EXPERIMENTAL POISONING WITH SUBLIMATE AND MERCURY VAPOR. ((Zmjany morfologiczne w nerkach w doswiadczalnym zatruciv sublimatem oraz parami rteci)) Patol. Polska (Warsaw) 18(1):33-43, 1967. Text in Polish

a group of 47 rabbits composed of a mixed breed of both sexes, was divided into a control and two groups which were experimentally poisoned with mercury. The first group of 15 received a single intravenous dose of 3 mg/kg of sublimate. The second group of 30 rabbits was exposed to a mercury vapor atmosphere of 10.6 mg/cu m for 1 1/2 hr daily for 30 days after which they were sacrificed. In the first group, the blood creatinine level rose from 1.39 mg % to 4.8 mg%; the uric acid level from 1.07 mg% to 1.12 mg%, and great quantities of albumin, sediment, and red blood cells were found in the urine. The animals were sacrificed after 4 days. Histological examination of the kidneys showed severe damage in the renal epithelium, more pronounced than in the second group. Urinary levels of the following ions in the second group rose to these maximums during the 2nd week: Na, 615 mg (control, 163 mg); K, 143 mg (control 40 mg; Ca, 19.4 mg (control 5.8 mg) and dropped gradually during the 3rd and 4th weeks. Blood creatinine was normal; uric acid rose to 1.63 mg% (control 1.07 mg%) after 4 weeks. Both groups showed damage to the renal arteries, with thickening of the vascular walls, endothelial proliferation, and perivascular fibrosis.

07319

Copplestone, J. F. and D. A. McArthur

AN INORGANIC MERCURY HAZARD IN THE MANUFACTURE OF ARTIFICIAL JEWELRY. Brit. J. Ind. Med. (London), 24(1):77-80, Jan. 1967. 16 refs.

An unusual inorganic mercury hazard in a factory manufacturing artificial jewelry is described. There was a decided mercury exposure in the jewelry plant where a mercury-cadmium amalgam is poured into rubber molds which are removed when the heated amalgam cools. The castings are encased in plaster and heated from 1000 to 1200 deg C overnight. These operations, along with the recovery still, were responsible for concentrations in the air up to 0.5 mg/cu m of mercury in the general atmosphere and up to 2000 micrograms/liter of urine. Despite the high concentrations, no worker showed any overt evidence of mercurialism and there had been no complaints of illness among them. It is possible that mercurialism might be due to an inability to excrete absorbed mercury rather than simply to exposure. The poor excretion might be due to failure of the mercury to reach the kidney or to selective tubular resorption. Preventive measures have resulted in a slow fall in urinary concentrations over a period of several months.

07330

V. Parameshvara

MERCURY POISONING AND ITS TREATMENT WITH N-ACETYL-D- PENICILIAMINE. Brit. J. Ind. Med. (London), 24(1):73-76, Jan. 1967. 11 refs.

Two cases of chronic inorganic mercury poisoning of moderately rapid onset are described. Although exposure was the same in the two patients, the mercurial poisoning affected chiefly the kidneys in one and the gums in the other. Mercurialentis and corneal opacities were seen after short exposure to the metal. One case was treated successfully with N-acetyl-D-penicillamine. No toxic effects were observed and this is suggested as the treatment of choice for mercury poisoning. (Author's abstract)

07337

M. Lob

CHRONIC MERCURY POISONING IN THE MANUFACTURE OF FLUORESCENT TUBES. ((Intoxications Chroniques par le Mercure dans l'Industrie des Tubes Luminescents.)) Text in French. Arch. Mal. Prof. (Paris), 26(6):289-292, June 1965. 4 refs.

The mercury hazard among glass blowers engaged in the manufacture and repair of fluorescnet lamps is discussed on the basis of a survey of 11 plants and clinical evidence of 12 glass blowers involved in an exposure with little or no regard for ventilation, housekeeping, good practice, or awareness of the hazard; 50% of the workers showed signs of mercury poisoning. The symptoms included nervousness, irritability, loss of libido, impotence, tremors, dermographism. The average mercury in the urine was 125 microgram/liter with three results equaling 200, 310, and 350 microgram/liter. The air samples varied from 0.20 to 0.35 mg/cu m and were generally below the minimum allowable concentration of 0.1 mg/cu m. Although one patient with 21 years of exposure and classical symptoms of mercury poisoning showed only 20 microgram/liter of mercury in the urine, this was regarded as evidence that he was not eliminating mercury, and not that he was not exposed to it. Control measures were recommended which were based on an educational campaign, improved housekeeping, better ventilation, the elimination of mercury spillage, and the removal of mercury already spilled. The practice of sucking mercury into tubes by mouth should be forbidden. The efficacy of the controls should be checked by periodic air sampling and medical examinations. The uncontrolled use of mercury by glass blowers in the manufacture of fluorescent tubes produces a serious mercury poisonging hazard.

07423

Heimann, H.

STATUS OF AIR POLLUTION HEALTH RESEARCH, 1966. Arch. Environ. Health, 14(3):488-503, Mar. 1967. 178 red Health, 14(3):488-503, Mar. 1967. 178 refs. (Presented in part before the American Industrial Hygiene Conference, Pittsburgh, Pa., May 16-20, 1966.)

Consideration is limited to man-made air pollutants, omitting naturally occurring adventitious airborne materials. Radioactive materials were not discussed. Acute episodes of air pollution; systemic effects of air pollution caused by arsenical compounds, mercury, beryllium, lead, carbon monoxide, economic poisons, manganese, and asbestos; air pollutants as irritants; medical conditions such as acute nonspecific upper respiratory disease, chronic obstructive ventilatory diseases, chronic bronchitis, pulmonary emphysema, bronchial asthma, and lung cancer, are reviewed.

08079

Keenan, Robert G.

CHEMICAL ASPECTS OF ENVIRONMENTAL HEALTH. Occupational Health Rev.Ottawa, 18(1):3-8, 1966. 39 refs.

Modern methods of physical and chemical analysis, as applied to biological materials, atmospheric samples containing gaseous or particulate contaminants, industrial process materials, intermediates, and finished products are discussed briefly. A discussion of the uses to be made of such analytical data includes: (1) the 'normal' concentrations of certain metallic elements in body tissues and fluides; (2) the need to compare these concentrations with those developed analytically on samples from exposed subjects; (3) the comparison of atmospheric concentrations of contaminating substances found in the work-

ing environment with the A.C.G.I.H. Threshold Limit Values; (4) the analysis of industrial process materials, settled dusts, and finished products to help in assessing the total exposure of the worker to chemical elements. (Author0s abstract, modified)

08092

Beliles, R. P., R. S. Clark, P. R. Belluscio, C. L. Yuile, and L. J. Leach

BEHAVIORAL EFFECTS IN PIGEONS EXPOSED TO MERCURY VAPOR AT A CONCENTRATION OF 0.1 MG/CU M Am. Ind. Hyg. Assoc. J., 28 (5): 482-484, Sept. - Oct. 1967. 6 refs.

Earlier studies have shown that exposure to high concentrations of mercury vapor (17 mg/cu m) induced changes in the operant behavior of pigeons. The sensitivity of operant behavioral techniques in pigeons exposed to a mercury vapor concentration nearer the threshold limit value of 0.1 mg/cu m was assessed. Three male Carneaux pigeons (one control, two experimental) were trained to a multiple fixed ratio, fixed interval schedule of reinforcement. After relative behavioral stability was obtained, the experimental animals were exposed 6 hours a day for 20 weeks to mercury vapor at a concentration level of 0.08 mg/cu m. No behavioral, histological, or gross signs of mercurialism were noted. (Authors0 abstract, modified)

08167

Trakhtenberg, I. M.

THE TOXICITY OF VAPORS OF ORGANIC MERCURY COMPOUNDS (ETHYLMERCURIC PHOSPHATE AND ETHYLMERCURIC CHLORIDE) iN ACUTE AND CHRONIC INTOXICATION. (EXPERIMENTAL DATA). In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 205-210, May 1960. CFSTI: TT 60-21475

Inhalation by white mice of vapors of organic mercury compounds, such as ethylmercuric phosphate and ethylmercuric chloride, caused acute or chronic poisoning varying in severity with the duration of exposure and vapor concentration. Poisoning by the mercury compounds followed a definite course and terminated in the death of the animals. Acute poisoning seriously affected respiration and, to a lesser degree, the nervous system. In chronic intoxication the control nervous system was basically affected. Vapors of ethylmercuric phosphate and chloride proved more toxic than metallis mercury vapor.

08328

Molokhia, Mohamed M. and Hamilton Smith

TRACE ELEMENTS IN THE LUNG. Arch. Environ. Health, Vol. 15, p. 745-750, Dec. 1967. 15 refs.

The concentrations of three essential (copper, manganese, zinc) and four nonessential (antimony, arsenic, cadmium, mercury) trace elements in the lungs of a random healthy population were surveyed and show the characteristic modes of distribution. Against this background are set the findings of an investigation of the distribution of trace elements throughout the lungs themselves. These results show the tendency of nonessential trace elements to accumulate in higher concentrations in the lung parenchyma than in the surrounding unexposed tissue. That the source of this accumulated material is probably airborne dust is supported by the fact that the apex of the lung tends to be more contaminated than the base. The lower concentrations of trace elements in cancerous lung tissue than in healthy lung may in part be due to the shorter exposure time of the neoplasm to atmospheric dust. The picture within the nonessential element group tends to vary. This is shown by the low lymph-node concentration of mercury and cadmium when compared with the antimony and arsenic levels and may be due to the varying ease of absorption and removal of particulate contaminants by the normal body processes. The situation with respect to the essential trace elements is more obscure, perhaps due to a concentration control mechanism combined with varying ease of absorption. (Authors' summary)

08387

N. A. Al'terman, S. F. Sorokina

DISEASE INCIDENCE IN UNDERGROUND WORKERS IN MERCURY MINES. 110 zabolevaemosti podzemnykh rabochikh rtutnykh shakht.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 31(7-9):37-40, July-Sept. 1966. 8 refs.

The medical reports of 458 undergroun workers for 1961-1963 were analyzed. The majority were 21-40 years old, while only 7.5% of the subjects were over 50 years of age. Some workers (31.5%) had worked in the mercury mines for up to five years 33.2% up to 10 years; 24.4%, up to 15 years; and 10.9% had worked longer than 16 years. The incidence of industrial trauma, tonsillitis and radiculitis decreased significantly between 1961 and 1963. During this period the average incidence per 100 workers for grippe was 3.3; for upper respiratory tract infections, 15.3; for tuberculosis, 0.5; and 7.7 for tonsillitis and exacerbation of chronic tonsillitis. A comparison of workers in coal mines and in mercury mines indicates that the mercury mine workers suffer most frequently from grippe and upper respiratory tract infections, while the coal miners suffer principally from industrial trauma. Furthermore, the length of work experience, age, and occupation are directly related to the incidence of morbidity in the mercury mine workers. Thus, incidence of emphysema increased markedly, from 4.4 per 100 workers with work experience of up to five years, to 30.8 per 100 workers with experience of 16-20 years. Occupation is related to incidence of certain diseases: acute upper respiratory tract infection and radicultis were higher in the cutters, who also had a higher incidence of chronic bronchitis (often combined with emphysema). These mercury mine workers developed silicosis after working an average of 15 years; in another mercury mine, silicosis appeared after an average service of 4.5 years. This difference is related to the reduction of dust in the mines (by a factor of seven) following the introduction of wet drilling with naphthenate soap. Bronchitis is regarded as an occupational disease related to the presence of aerial dust in the mine.

08746

A REVIEW OF THE TOXICITY AND METABOLISM OF MERCURY AND ITS COM- POUNDS. Med. Serv. J. (Can.) 23(5):886-808, May 1968. 113 refs.

Mercury poisoning is most frequently brought about by inhalation of mercury vapors. It is usally confined to industry, but cases such as the death of two female stenographers in a warehouse in Alberta, where diethyl mercury phosphate was stored, have been re- ported. The frequency of positive cases of mercurialism tends to increase with increase in duration and intensity of exposure, es- pecially when exposure is to high concentrations in the air. This appears to be statistically significant for large groups of indi- viduals, but does not apply to single cases. Several cases of mercurialism were found in individuals who had been exposed for 8 years or longer to concentrations of mercury in air less than the M.A.C. of 0.1

mg./cu. m. In general the excretion of mercury in the urine is directly related to the concentration of mercury in the air and the degree of exposure. There is a lack of correla- tion between urinary mercury and clinical manifestations of poisoning. Similar observations were made on mercury concentrations in the blood. When mercury is absorbed or inhaled an an in- organic or phenyl compound, it leaves the blood in a matter of hours and much of it is promply excreted in the urine. This is not true of the alkylmercurials, which are highly toxic. D. pen- cillamine and BAL (2,3-dimercaptopropanol) have been used in the treatment of mercury poisoning. However, BAL is the effective drug of choice.

09056

Ulfvarson, Ulf

DETERMINATION OF MERCURY IN SMALL QUANTITIES IN BIOLOGIC MATERIAL BY A MODIFIED PHOTMETRIC-MERCURY VAPOR PROCEDURE. Acta Chem. Scand., 21(3):641-646, 1967. 5 refs.

A modification of the Jacobs-Yamaguchi method of determining mercury is presented. In the original method mercury is extracted with dithizone in chloroform from incompletely digested samples. The dithizone-mercury complex is subjected to heat destruction and the resulting mercury vapor is determined photometrically. This method suffers from some disadvantages among which is a low and uncertain maximum deflection because of a lengthy evaporation period for the mercury vapor during the heat destruction of the dithizone-mercury complex, and in some cases background readings from interfering substances. In the presented modification the mercury vapor is absorbed on gold and then released again rapidly by mild heating of the gold filter. The method results in comparatively high reading even with amounts of mercury as low as 5 ng. The coefficient of variation of determinations of mercury in a standard solution has been found to be about 30%, when amounts of mercury varying from 5 to 100 ng were determined. The method has been controlled by comparison with neutron activation analyses and scintillation analyses of radioactive mercury. These comparisons show that analysis of samples containing more than 10 ng of mercury per g can be made with the photometric method to give results of the correct order of magnitude. Silver or copper will not influence the determinations. Iodide, however, will inhibit the extraction of mercury from the digest solution when present in amounts of the same order of magnitude as the mercury itself. (Author's abstract)

09396

Kosmider, S.,S. Zajaczkowski, and E. Rogowska

ACTIVITY OF SERUM CHOLINESTERASE IN EXPERIMENTAL POISONING WITH METALLIC MERCURY. Patol. Polska. Vol. 17, No. 1, 1966. 15 ref Translated from Polish by I. Jampoler in Polish Med. J., 5(5):1044-1048, Oct. 1966.

Serum cholinesterase activity was studied in a group of 25 rabbits exposed for 30 days to 1.5 hr. daily to 10.6 mg/cu.m. mercury vapor. Increased diuresis and salivation were observed in all rabbits. Daily urinary excretion of Hg increased, from 11-35 gamma in the first week of exposure to 117 125 gamma. Serum cholinesterase activity dropped significantly after the 30-day exposure. Studies of human serum cholinesterase in vitro also indicate enzymatic activity is reduced by the presence of Hg ions. A drop in serum cholinesterase activity could be of diagnostic value in the examination of persons exposed to mercury.

09397

Kosmider, Stanislaw and Zdzislaw Dabrowski

CATALASE ACTIVITY OF THE RED BLOOD CELLS, BRAIN AND LIVER IN EXPERIMENTAL POISONING WITH METALLIC MERCURY. Arch. Immunol. Therapiae Exp. 14(1):74-78, 1966. 18 refs.

Catalase activity of erythrocytes, liver and brain was studied in 19 rabbits exposed for 30 days for 1.5 hrs. daily to 10.6 mg/cu m mercury vapor. Salivation and apathy were observed. Urinary excretion of Hg rose from 11-35 gamma daily in the first week of exposure to 117-125 gamma in the following weeks. Controls were normal. Erythrocyte catalase activity increased significantly after 30 days exposure, but increased to lesser degrees in the liver and cerebral tissues. Increased enzyme activity may be an expression of a cellular defense mechanism to the effect of the Hg ions.

09406

Nordberg, Gunnar and Fredrik Serenius

DEPOSITION OF INHALED MERCURY IN LUNG AND BRAIN--PRELIMINARY COMMUNICATION OF A STUDY ON THE GUINEA-PIG. ((Lung- och hjarndepositionen av inhalerat kvicksilver--Preliminart meddelande fran en undersokning pa marsvin.)) Text in Swedish. Nord. Hyg. Tidskr. 47(1):26-27, Jan. 1966.

The distribution of radioactive mercury in lung and brain tissue of guinea pigs was examined using autoradiography. Mercury was found in the bronchial tree as well as in the alveoli. Shortly after exposure, the mercury in the brain was concentrated in the cortex and cerebellum. Some 6-16 days after exposure, however, the level of mercury in the cerebrum was lower in the cortex than in the white matter of the corpus callosum. At these longer post-exposure intervals, some parts of the brain stem also concentrate high levels of mercury. (Authors' abstract, modified)

09524

Gimadeev, M. M.

SULFHYDRYL GROUPS CONTENT IN THE BLOOD SERUM OF RABBITS IN CHRONIC INTOXICATION WITH LOW MERCURY FUMES CONCENTRATIONS. ((Soderzhanie sulfgidrilnykh grupp v syvorotke krovi krolikov pri khronicheskoi intoksikatsii parami rtuti v malykh kontsentratsiyakh.)) Text in Russian. Farmakol. i Toksikol. (Moscow), 28(4):483-484, 1965.

Rabbits were exposed 6 hours daily for 6 months to mercury vapor levels of 0.01 to 0.15 mg/cu m and the blood sulfhydryl content studied. Sulfhydryl groups were determined by iodometric titration from blood samples withdrawn at 10-15 day intervals and later at 20 -30 day intervals. The mercury vapors caused a gradual reduction in the sulfhydryl group concentrations but when exposure was discontinued, sulfhydryl concentration normalized within 15 days.

10361

Trakhtenberg, I. M., I. V. Savitskii and R. Ya. Shterengarts

THE EFFECT OF LOW MERCURY CONCENTRATIONS ON THE ORGANISM. THE QUESTION OF SIMULTANEOUS EFFECTS OF TOXIC AND TEMPERATURE FACTORS). ((O vliyanii na organizm malykh kontsentratsii rtuti. (K volrosu o sovmestnom deistvii toksicheskogo i temperaturiogo fakorov.))) Text in Russian. Gigiena Truda i Prof. Zabolevaniya 9(12):7-12, Dec. 1965.

Mercury poisoning can occur even at low concentrations such as a a few hundred mg/cum, and particularly in the presence

of high temperatures. To determine the combined effect, a series of tests were run on animals and in an industrial environment (Moscow Electric Bulb Plant). Three groups of workers with varying degrees of exposure to mercury and at different room temperatures were observed during 1955-1962. Results, including workers' complaints, are tabulated and approximate each other. Test animals (white mice and rabbits) were subjected to a 4-6 hr. daily inhalation of 0.01-0.003 mg/cum mercury for 30-50 days. Another group was exposed to 38-40 deg. C. temperature, while a third group was exposed to both. The high temperatures significantly increase the specific impact of mercury on the health of the animals, producing shifts in the blood serum protein levels (14.2% increase in gamma globulin; 9.4% decrease in albumin and in tissue sulhydryl level). Loss of weight averaged 27%. Mice which were fed mercuric chloride and kept at 40 Degrees C. developed anemia and a weight loss of 12%. Death rate was 50-62% with mice beginning to expire 10-15 days after the start of tests.

11241

E. M. Roth, W. H. Teichner, and A. O. Mirarchi

CONTAMINANTS STANDARDS. (SECTION 13.) In: Compendium of Human Responses to the Aerospace Environment, Volume III, Sections 10-16, Emanuel M. Roth (ed.), Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., CONTRACT ¼NAS-115, p. 1-115, Nov. 1968. 233 refs. CFSTI: NASA CR-1205(III

Toxicological problems in space operations cover three situations: (1) the acute, short term, high-level exposure either in ground support or space cabin conditions; (2) the 8-hour work day exposure found in manufacturing and ground support situations; and (3) continuous, long term exposure to trace contaminants, such as would be anticipated in extended space missions. In view of the necessity for provisional limits of manned space flights of 90 to 1000 days duration the following criteria for trace contaminant control in manned spacecraft have been derived: Contaminants must not produce significant adverse changes in the physiological, biochemical, or mental stability of the crew. The spacecraft environment must not contribute to a performance decrement of the crew that will endanger mission objectives. The spacecraft environment must not interfere with physical or biological experiments nor with medical monitoring. Based on these criteria air quality standards for prolonged manned missions have been established. The following topics are discussed: kinetics of contaminants in space cabins; toxicological factors; toxicology in the spacecraft environment; source of contaminants; particulates and aerosols; microbial contaminants. Tables presenting chemical analysis of all contaminants with standard levels for space cabins are listed.

11556

Clarkson, T. W.

BIOCHEMICAL ASPECTS OF MERCURY POISONING. J. Occupational Med., 10(7):351-355, July 1968. 29 refs.

Since the results of studies on the localization of mercury and its effects on particular enzymes and subcellular particles (e.g., the lysosomes) have been inconclusive, this review deals mostly with the biotransformation of mercury and its compounds in living systems. Particular attention is given to the biotransformation of organic mercurials, especially their degradation in mammalian tissues and the fate of such compounds when released into the soil after use as fungicides. The organic mercurials apparently yield inorganic mercury, which can in turn be transformed into methyl-mercury, a cumulative and irreversible poison. It has also been shown that metallic mercury can be oxidized rapidly in the blood, but that mercuric ion may also be rapidly volatilized (at least by microorganisms). Mercury vapor seems to be taken up much more rapidly than mercuric ion by the brain. The toxicological properties of the alkyl mercurials are also reviewed, with particular attention to the mercurial diuretics and the kidney damage which they may produce. The isotope exchange technique has been used to determine whether the toxic effects of the alkyl mercurials are due to inorganic mercury, and whether any inorganic mercury which is produced remains in the tissues for long periods. Previously published data are cited on the toxicity (LD50, renal accumulation of Hg) of $HgCl_2$, p-chloromercuribenzoate, and chlormerodrin in rats and mice.

12653

M. H. Berlin, G. F. Nordberg, F. Serenius

ON THE SITE AND MECHANISM OF MERCURY VAPOR RESORPTION IN THE LUNG. A STUDY IN THE GUINEA PIG USING MERCURIC NITRATE Hg_2O_3. Arch. Environ. Health, 18(1):42-50, Jan. 1969.

The percentage of whole-body mercury found in the lungs of guinea pigs exposed to mercury vapor for ten minutes was in the same range as after one hour's exposure (25% to 33%). The highest concentrations of mercury were found in peripheral lung structures. The same distribution was found at different concentrations of mercury in the air. Only one tenth of the values were found in corresponding structures of animals injected with mercuric nitrate. Most of the mercury deposited in alveolar tissues is therfore probably deposited there directly from the air. The results are considered to indicate the following: That mercury vapor penetrates to the alveoli; that most of it is quickly transferred to the blood; and that a small fraction is deposited in the pulmonary tissues, from where it is slowly eliminated to the rest of the body. (Author's Abstract)

13035

Kudsk, F. Nielsen

UPTAKE OF MERCURY VAPOUR IN BLOOD IN VIVO AND IN VITRO FROM HG- CONTAINING AIR. Acta Pharmacol. Toxicol., 27(2-3):149-160, 1969. 26 refs.

Experiments were conducted to confirm previous results on mercury vapor absorption by the lungs in human subjects, to clarify the mechanism by which mercury vapor is taken up, and to explain the inhibitory effect of ethyl alcohol. Results showed that the respiratory dead space for mercury vapor in human subjects corresponds to the physiological dead space, which indicates a complete alveolar absorption of mercury vapor in the lungs. The rate of uptake of mercury vapor in blood in vitro was determined, the vapor was absorbed by the blood and plasma at a higher rate during the first hour. Results showed a pronounced inhibitory effect of ethyl and methyl alcohol on the in vitro uptake of mercury vapor in blood, but isopropyl and n-butyl alcohol did not show similar inhibition. A possible involvement of the primary hydrogen peroxide-catalase complex or catalase only in the oxidation and uptake of mercury in erythrocytes was investigated, using aminotriazole as an inhibitor, either alone or in combination with methylene blue and glucose as a hydrogen peroxide-generating system. Aminotriazole had no effect. Methylene blue alone, and especially in combination with glucose, caused a pronounced accelerated uptake of mercury in the erythrocytes. (Author summary modified)

13154

Tada, Osamu

ON THE METHODS OF EVALUATING THE EXPOSURE TO TOXIC SUBSTANCES BY ANALYZING THE METABOLITES IN THE BODY. (Tainai taisha sanbutsu n yoru yugaibutsu bakuro hyokaho). Text in Japanese Rodo Kagaku (J. Sci. Labour, Tokyo), 45(4):171-183, 1969. 177 refs.

Under certain conditions, the amount of toxic substance absorbed by workers exposed to toxic air contaminants cannot be predicted from air analysis data. If the concentration of metabolites in tissue or excreta is proportional to that of the toxic substance in the air, the degree of adverse exposure may be evaluated by analyzing samples of expired air, blood, urine, or hair, with reference to atmospheric threshold limit values. Tests for assessing the level of exposure to carbon monoxide, mercuric vapor, inorganic lead, and chlorinated hydrocarbons are discussed. Of the various methods developed for determining the carboxyhemoglobin level in the blood of workers exposed to carbon monoxide, the 20-second breath holding method is the most practical and convenient. If the determination is carefully made, the urinary excretion of mercury can be used as an indicator of exposure to mercuric vapor. The absorption of lead varies according to whether it is absorbed as fume or dust. Therefore, the degree of exposure should be evaluated by analyses of lead in urine or blood during repeated exposure. The storage of lead in the body can be determined by the increase in urinary excretion of lead following the administration of calcium ethylenediaminetetraacetate. The determination of urinary excretion of alkaline-pyridine reactants is tentatively suggested as an indicator of exposure to chlorinated hydrocarbons. (Author abstract modified)

13446

Anbar, M. and M. Inbar

THE EFFECT OF CERTAIN METALLIC CATIONS ON THE IODIDE UPTAKE IN THE THYROID GLAND OF MICE. Acta Endocrinol. (kobenhaven), 46:643-65 Aug. 1964. 21 refs.

It has been reported that certain metal ions interfere with the iodine uptake in the thyroid. The effect of various metallic cations on the iodine uptake into the gland was studied. Ten experimental mice were used for each material to be examined. The metallic cations to be tested were administered in isotope form and traced by a radioactive tracer. The iodine uptake was calculated in terms of % of injected dose accumulated in the gland or as a concentration ratio. Ferric, cupric, mercuric, zinc, cadmium, and nickel ions at the dose level of 0.1 millimoles per kg body weight were found to decrease the uptake of iodine in the thyroid gland. Manganous ions exhibited a similar effect when the dose was doubled. A parallel decrease in fluoroborate could be demonstrated. This suggests an interference at the stage of iodide accumulation. Cobaltous, cobaltic, magnesium, beryllium, and zirconium ions were shown to have not effect on iodine uptake at the same dose level. The extent of influence upon thyroxine production was discussed.

13625

Lindberg, Walter

AIR POLLUTION IN NORWAY. II. PUBLIC HEALTH ASPECTS OF AIR POLLUTION - A LITERATURE STUDY. (Den Alminnelige Luftforurensning i Norge. Luftforurensning som Helseproblem, - en Litteraturstudie.) Translated from Norwegian. Oslo Univ. (Norway), p. 66-77, 1968.

This presentation discusses functional and anatomical changes arising from diseases caused by air pollution. The discussion includes air pollution episodes, pollutants known to cause specific effects (arsenic compounds, mercury, beryllium compounds, manganese compounds, and lead). Lead and carbon monoxide are discussed in greater detail. Emphasis is also placed on respiratory irritations caused by SO2, nonspecific upper respiratory diseases, the effect of air pollution on the occurrence of colds, smoking, chronic bronchitis emphysema, bronchial asthma, lung cancer, and heart disease.

17470

Shirakaw, Kenichi

SYMPTOMS OF NERVE TROUBLE DUE TO PUBLIC NUISANCE. HEAVY METALS AND ORGANIC SOLVENTS. (Kogai niyoru shinkeishojo. Jukinzoku to yukiyozai). Text in Japanese. Nippon Rinsho (Japan Clin.), 28(3):551-555, March 10, 1970. 10 refs.

Characteristic symptoms of heavy metal and organic solvent poisoning are discussed, with emphasis on representative neural symptoms. Motor symptoms identified with inorganic lead poisoning are paralysis of the arms, mononeuritis, and polyneuritis, the latter characterized by sharp contractions of the legs and arms. Early symptoms of alkyl lead poisoning are chronic fatigue, headache, and vertigo. These are followed by muscular ache, low fever, perspiration, low blood pressure, feeble pulse, and declining mental faculties, which are defined as nerve debility at the serious stage. Arsenic poisoning manifests itself in catarrh of the digestive and respiratory organs and in neuritis and skin disease. In arsenic poisoning, perceptive nerve troubles appear after one or two weeks' exposure, followed by mental derangement and, in some cases, pain, resulting in the loss of sensation of movement. Barium poisoning is considered a cause of alopecia and polyneuritis. Acute cases exhibit fever, skin disease, alimentary and mental disorders, in addition to respiratory diseases. The latter can result in death. Chronic inorganic mercury poisoning is accompanied by vertigo, insomnia, and heart acceleration. Organic mercury poisoning exhibits diverse symptoms, including concentric constriction of the visual field. Immediately following ingestion, manganese produces hallucination and mental disorders. Chronic manganese poisoning manifests in symptoms resembling those of Parkinson and Wilson's disease. Tin poisoning does not appear to remarkably influence neural organs, though alimentary disorders can result from prolonged exposure. Symptoms of cadmium poisoning, in addition to those of organic solvents, are briefly reviewed.

18036

Berlin, Maths, Jerry Fazackerley, and Gunnar Nordberg

THE UPTAKE OF MERCURY IN THE BRAINS OF MAMMALS EXPOSED TO MERCURY VAPOR AND TO MERCURIC SALTS. Arch. Environ Health, 18(5): 719-729, May 1969. 8 refs.

Rats, rabbits, and monkeys were exposed to mercury vapor (1 mg/cu m) for four hours, and uptake and distribution of mercury in the brain was compared with that of animals injected intravenously with the same dose of mercury as mercuric salts. Vapor-exposed animals showed a brain content about ten times higher than the injected animals. The results indicate that the higher uptake in brain following vapor exposure is a general phenomenon in mammals. (Author's Abstract)

18128

Hallee, T. James

DIFFUSE LUNG DISEASE CAUSED BY INHALATION OF MERCURY VAPOR. Am. Rev. Respirat. Diseases, 99(3):430-436, March 1969. 15 refs.

Acute exposure of a five-member family to varying amounts of mercury vapor is reported. Severe interstitial pneumonia and hypoxemia developed in the father, who was most affected. Pulmonary function studies performed 25 days after exposure revealed moderate restrictive lung disease and mild hypoxemia. He was treated with oxygen, antimicrobial drugs, and dimercaprol (BAL). Because of continued dyspnea on exertion five months after exposure and evidence on arterial blood gas analysis of intrapulmonary shunting, a lung biopsy was performed. The biopsy revealed minimal interstitial fibrosis, and the patient remained mildly dyspneic on exertion 1 year after exposure. Symptoms and treatment of the other members of the family are given.

18247

Kudsk, F. Nielsen

FACTORS INFLUENCING THE IN VITRO UPTAKE OF MERCURY VAPOUR IN BLOOD. Acta. Fharmacol. Toxicol. (Copenhagen), 27(2-3):161-172, 1969. 24 refs.

The influence of a number of factors on the in vitro uptake of mercury vapor in blood was investigated to clarify the mechanism by which mercury is oxidized in the blood. The rate of mercury uptake was moderately increased in a pure oxygen atmosphere, but decreased in a nitrogen atmosphere when compared with the rate of uptake in atmospheric air. Both methylene blue and menadione, in high concentrations, were found to increase the rate of uptake. Hydrogen peroxide generation and an increased oxidation rate of glutathione is a possible explanation for the acceleration of mercury uptake caused by these compounds. The menadione-stimulated uptake could be inhibited by low concentrations of ethyl alcohol. Iodoacetate, in concentrations lower than .00025 M, inhibited the mercury uptake, while concentrations of .0005 M produced an uptake which was 2.5 times that of the normal. The influence of potassium cyanide, sodium nitrate, hydroxylamine, ascorbic acid, sodium fluoride, and glutathione on mercury uptake in blood was investigated. The studies indicate that hydrogen peroxide and oxidized glutathione are important in the oxidation and uptake of mercury vapor. (Author summary modified)

19190

Ui, J., Kyoichi Sonoda, and Nobuko Iijima

PROGRESS OF 'KOGAI' CONTROL AND PUBLIC OPINION. (PART III). (Kogaitaisaku no Keisei to Seron. (Sono III)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):409-417, June 15, 1970.

Nearly 10 yrs ago, many persons died in Minamata as the result of eating fish poisoned by mercury discharges from a chemical plant. The deaths were unique and unprecedented, but six years passed before mercury was identified as the toxic agent. In the course of tracing the source of the mercury, investigators were hampered by various objections and political pressures designed to withhold information from the public. As a result, public opinion became quiescent until a similar case of mercury poisoning occurred at Niigata. That the poisoning was repeated is viewed as characteristic of the Japanese attitude about public opinion and of the extreme aggravation of industrial pollution, which the social system appears incapable of controlling. The two mercury poisoning episodes symbolize the conflicts between industry and local communities, capital and science, the right of local governments and central bureaucratic power, society and power holders and also the obstacles to research.

21113

Neville, G. A.

TOXICITY OF MERCURY VAPOR. Can. Chem. Educ., 3(1):4-7, Oct. 1967. 33 refs.

Threshold limit values have been set at 0.1 milligram/cu m for mercury vapor in the atmosphere and at 0.01 milligram/cu m for mercury organic compounds. Access to the body is gained mainly through the respiratory tract, but absorption may be also through the skin or by ingestion. A study of the metabolism of inhaled vapor in the rat indicated that after exposures of 5 hours to an Hg level of 1.4 milligrams/cu m, the metal was generally distributed in the body, becoming highly localized in the kidney with an accumulation after 15 days of 70% or more of the body burden. Mercury inhibits urease, invertase, and other enzymes carrying sulphhydryl groups; produces potassium ion loss; blocks glucose uptake by erythrocytes and muscle; causes lesions of the central nervous system; and influences bioelectric phenomenon by altering transmembrane potentials and by blocking nerve conduction. The most frequent manifestations of chronic poisoning are gingivitis and stomatitis, tremor, and erethism, while death usually results from acute cases. Mercury spillages are most conveniently cleaned up with a filter flask, the side arm of which is linked by tubing to a water aspirator. The importance of thorough washing of the hands must be emphasized.

23012

Tsuchiya, Kenzaburo

EPIDEMIC OF MERCURY POISONING IN THE AGANO RIVER AREA. AN INTRODUCTORY REVIEW. Keio J. Med., vol. 18:213-227, 1969. 10 refs.

A review is given of the established data and of several hypotheses relating to the epidemic of methyl mercury poisoning which affected 26 humans as well as large numbers of domestic animals in the Agano River delta, Niigata Prefecture, Japan. The outbreak started in 1964 and ended in July 1965. Most of the affected group, which included three females, were fishermen or a member of a fishermen's family. Data on mercury concentrations in hair, urine, and blood are given and the biological complex of humans, fish and environmental factors is considered. Evidence indicates that fishermen, who only live near the river mouth, were the victims because they eat one kind of fish which cannot usually be marketed due to its bonniness. In fish with higher concentrations of mercury, the mercury compound was most likely to be the agent of poisoning was methyl mercury rather than inorganic mercury. Various hypotheses as to the source of the methyl mercury are critically reviewed. These theories relate to an earthquake that occurred several months before the epidemic, to two acetaldehyde factories located along the river which supposedly discharge mercury into it, and to possible washout from pesticides. It is concluded that the source cannot be definitely established in the case of this particular epidemic.

26740

Epstein, Samuel S.

ADVERSE BIOLOGICAL EFFECTS DUE TO CHEMICAL POLLUTANTS: GENERAL PRINCIPLES. II. POTENTIAL CARCINOGENICITY, MUTAGENICITY AND TERATOGENICITY, DUE TO COMMUNITY AIR POLLUTANTS. In: Projec Clean Air. Children's Cancer Research Foundation, Boston, Mass., California Univ. Task Force, Vol. 2, App. M, 54p., Sept. 1, 1970. 111 refs.

There is little doubt that many diseases hitherto regarded as spontaneous, including cancer, mutations, and birth defects,

may have exogenous causes from environmental pollutants. This fear is accentuated by the exponential increase in human exposure to new synthetic chemicals--and their degradation and pyrolytic products in air, water and soil--which in general, are inadequately characterized both toxicologically and ecologically. Two major classes of environment carcinogens may be identified: potent carcinogens, such as aflatoxins and nitrosamines, which can produce cancer in experimental animals, even at the very low levels in which they have been found in foods; weak carcinogens, such as atmospheric pollutants, certain pesticides and food additives, whose effects may easily escape detection by conventional biological tests. Ethyleneimines are good examples of highly mutagenic chemicals which are used for many purposes, including therapy of neoplastic and non-neoplastic diseases, insecticides, pigment dyeing and printing, fireproofing and creaseproofing of fabrics textiles. Three major categories of human teratogens have so far been identified: viral infections, x-irradiation, and chemicals, e.g., mercurials and thalidomide. Methods for predicting and monitoring adverse biologic effects are discussed, with particular reference to carcinogenicity, mutagenicity, and teratogenicity.

27085

Jordi, A.

INDUSTRIAL TOXICOLOGY AND SOCIAL MEDICINE. (Gewerbliche Toxikologi und soziale Medizin). Text in German. Praxis (Bern), 57:785-793, June 4, 1968. 18 refs.

Toxicity of carbon monoxide increases as a result of various factor like fast smoking during the inhaling of air containing CO, reduction of partial oxygen pressure by other gases, or flying at altitudes of 3000 m. Since hypoxemia causes no sensation and gives no warning, the danger is especially great for automobile drivers and pilots. The gradual reduction of the leucocyte count has been known to physicians for 30 years. The count of 6000-8000 is no longer normal; today a count of 5000 is normal for urban populations. The causes, aside from exhaust gases, are various drugs like sulfonamides and antibiotics. Silicosis is still the most important occupational disease in Switzerland today in spite of intensive prophylaxis. The incidence of pulmonary asbestosis has increased somewhat since 1940 as has the incidence of lung cancer in contrast to silicosis. As a result of the processing of already purified cotton and good ventilation, byssinosis has rarely been observed in Switzerland in spite of the size of the textile industry. It seems to be more frequent in the jute and hemp industries. The incidence of chronic lead poisoning is in second place among recognized occupational diseases. The symptomatology is reviewed. Also reviewed are incidence, symptoms and social implications of poisonings by beryllium, by mercury and by organic solvents.

27317

McGee, Lemule C.

SOME OCCUPATIONAL DISEASE HAZARDS IN MUNITIONS MANUFACTURE. Trans. Natl. Safety Congr., 31st, 1942, p. 3-8. (Oct. 29.)

Some chemicals and solvents required in the manufacture of military powders and explosives have a toxic action on human tissues. Among them are trinitrotoluene, dinitrototulene, tetryl, mercury fulminate, nitrogen oxides, and acetone. The symptoms produced by each of these compounds in exposed workers are described.

27387

Mesman, Brick B. and Billy S. Smith

DETERMINATION OF MERCURY IN URINE BY ATOMIC ABSORPTION, UTILIZING THE APDC/MIBK EXTRACTION SYSTEM AND BOAT TECHNIQUE. Atomic Absorption Newsletter, 9(4):81-83, July-Aug. 1970. 7 refs.

A procedure is described for determining submicrogram quantities of mercury in urine. The method is based on the absorption of the 2537 A mercury resonance line. The urine specimens are extracted by an ammonium pyrrolidine dithiocarbamate/methyl isobutyl ketone (APDC/MIBK) system and the MIBK extract is evaporated on a tantalum boat. The mercury is detected by an atomic absorption spectrophotometer. A 50-ml urine sample is required, which allows for many replicate runs. Accuracy of the method is 96 plus or minus 6%. (Author abstract modified)

27801

Davis, Wayne H.

POLLUTION: WHENCE AND WHITHER. Arch. Environ. Health, vol. 21: 3-4, July 1970. 4 refs.

Earth is the test tube and as numbers of people continue to rise, pollution and other toxic products of our civilization will destroy the entire ecosystem. Mercury, lead, carbon monoxide, oxides of sulfur and nitrogen, pesticides, herbicides, and radioactive wastes are some of the toxins which have already caused serious trouble. The most important factor concerning a toxin is concentration. Concentrations of DDT and its metabolites in the environment have nearly eliminated the brown pelican, Bermuda petrel, osprey, peregrine falcon, and the eastern bald eagle. A fundamental law of ecology is that the more species in a community the more stable it is. The starfish population explosion which is destroying the coral atols and threatening wave erosion loss of islands from Hawaii to Australia probably results from man's effects on the ecosystem, most likely his use of DDT. Concentrations of a few parts per billion of DDT inhibit photosynthesis in marine algae. Such algae not only are the base of the food chain upon which marine animals are dependent, but they also provide most of our oxygen. The food production advocates say that the underdeveloped nations must increase pesticide usage six-fold in order to feed themselves. Since these nations are the poorest and DDT the cheapest, that pesticide will be used. Rise in the human population means destruction to all.

28013

Armstrong, David W.

THE QUANTITATIVE ANALYSIS OF THE MERCURY CONTENT OF URINE BY A SPECTROGRAPHIC METHOD. Public Health Bulletin, no. 263:106-110, 1941.

Reproducible values of mercury in urine were obtained by a spectrographic method in which sections of a special spectrographic graphite rod served as electrons. Both anodes and cathodes were drilled to a depth of five-eighths in. to receive the urine sample. This crater depth retarded excitation sufficiently to obtain a satisfactory photographic record. Thallium was used as an internal standard, and an exposure of 20 se at 22 amperes was found to be sufficient to volatilize the mercury and thallium completely. Under these conditions, the lowest value consistently attained by the analysis of prepared standards was 0.1 mg Hg/l (0.04 gamma of elemental mercury in the arc). The intensity of the radiation that produced the optical density of the exposed and processed photographic plate was determined from a prepared calibration curve. The spectrographic values are in good agreement with chemical values.

28030

Goldman, F. H.

THE QUANTITATIVE CHEMICAL ANALYSIS OF MERCURY IN AIR, URINE, TANK WATER, AND SETTLED DUST. Public Health Bulletin, no. 263:111-118 1941. 14 refs.

A series of experiments was conducted to determine whether mercury compounds passed into the air when carroted fur was treated with hot water in a manner which approximated certain operations regularly carried on in hat factories. It was found that mercuric nitrate could be recovered from the vapors released by moist carroted fur maintained at the temperature of boiler water. Becaus it appeared that there might be more mercury in the air in hatting factories than could be measured by the Nordlander instrument, a sampling method was devised for collecting both mercury vapor and mercury compounds for electrolytic analysis. The method includes treatment of a sample with chlorine and then with lead and hydrogen sulfide. A gold cathode and a platinum anode are used for electrolysis, while the current is obtained from a 6-volt storage battery hooked up in a series with a variable 60-ohm resistance. From this circuit, 1.3-1.5 volts are drawn off in the usual way. Addition of lead to the solution instead of copper considerably lessens the danger of contamination of mercury at the cathode.

28846

Sayers, R. R.

TOXICOLOGY OF GASES AND VAPORS. In: International Critical Tables of Numerical Data, Physics, Chemistry and Technology. Edward W. Washburn (ed.), vol. 2, New York, McGraw-Hill, 1927, p. 318-321. 14 refs.

Toxicological factors are presented for acrolein, ammonia, aniline, arsine, benzene, bromine, carbon disulfide, carbon dioxide, carbon monoxide, carbon tetrachloride, chlorine, chloroform, chloropicrin, dichlorodiethyl sulfide, hydrogen chloride, hydrogen cyanide, hydrogen sulfide, iodine, mercury, nitrogen oxides, nitrobenzene, phosgene, phosphorus trichloride, phosphine, sulfur dioxide, sulfur trioxide, and toluidine. These factors include boiling point, concentration percentage fatal in 30 min or less, percentage causing dangerous illness in 0.5 to 1 hour, percentage that can be borne without severe effects for 0.5 to 1 hour, maximum safe concentration, physical properties, portal of entry, symptoms, and occupations. An outline is also given for the prevention and emergency treatment of gas poisoning.

29255

Karimova, L. K.

THE CLINICAL ASPECTS OF GRANOSAN POISONING. Inst. of Hygiene of Labor and Industrial Diseases, Leningrad (USSR), 9p. Translated from Russian.

Several cases of poisoning due to the accidental use in food of grain treated with ethylmercurychloride were diagnosed among families of collective farm workers. The clinical picture presented by the disease was similar to that found in diethylmercurophosphate poisoning: patients exhibited gastrointestinal disorders, marked adynamia, general exhaustion, and functional disturbances of the central nervous system. The presence of the disease was confirmed by the continuous excretion of mercury in urine. A gradual improvement in the condition of the patients was noted following intravenous injection of glucose with vitamins B1 and C and subcutaneous introduction of unithiol, a new synthetic preparation recommended as an antidote in cases of arsenic and mercury poisoning.

29276

Stock, Alfred

CHEMICAL CONTRIBUTION TO THE UNDERSTANDING OF MERCURY INTOXICATION. (Chemische Beitraege zur Kenntnis der Quecksilbervergiftung). Text in German. Ber. Deut. Chem. Ges., 75(12), Pt. B:1530-1535, 1942. 28 refs.

Chronic intoxication with mercury resulting from exposure to low concentrations of mercury vapors over an extended period of time was studied to explore the mode of reaction of Hg in the organism. The analytical method developed by I. Bodnar and E. Szep was used for the determination of small quantities of Hg after the colorimetric method failed. Hg is an omnipresent element generally at a level of the order of magnitude of 1-10 gamma Hg/100g. Humans eliminate daily 0.1-1 gamma Hg in urine. Inhaled Hg is much more toxic than ingested Hg. Poisoning develops over a long time but once oversensitivity develops the smallest quantity of Hg will result in characteristic depression. All means designed to neutralize Hg in the body have failed. Most of the inhaled Hg vapor remains in the nose and the upper respiratory tract; the remainder reaches the lungs. The mucous membrane swells and a catarrh develops. Hg is absorbed easily because it is quickly oxidized by blood to HgO. The kidneys store Hg from the body fluids and release it only slowly. A smaller accumulation also occurs in the liver and glands of inner secretion, especially in the hypophysis and the bulbi of olfactorii. The normal content of Hg in human muscle tissue was found to be about 0.5 gamma Hg/100 g, 2 gamma in the brain, and 10 gamma in the kidney and in the hypophysis.

30308

Sasa, Tsurayuki, Kunio Aso, Fumio Kida, Jugoro Takeuchi, Tadao Tsubaki, Haruhiko Tokuomi, Toshio Toyama, Noboru Hagino, Toshiyuki Fujino, Masakichi Mikuni, Isamu Murata, and Ukichi Ishibashi

STUDY ON THE RANGE OF DISEASES BY ENVIRONMENTAL POLLUTION. (Kogai no eikyo ni yoru shippei no hani to ni kansuru kenkyu). Text in Japanese. Japan Public Health Assoc., 48p., March 1970.

A committee was organized to investigate problems concerning the names of diseases, their deuteropathy, and test items, which are the objects of the health injury assistance scheme. Particular attention was given to diseases caused by air pollution, organic mercury compounds, and cadmium. Bronchial asthma, chronic bronchitis, asthmatic bronchitis and vesicular emphysema were selected as the names of diseases caused by air pollution. It was decided that their secondary symptoms should be treated collectively as deuteropathy. For diagnosis, Fletcher s definition for chronic bronchitis, the American Thoracic Society s definition for vesicular emphysema were used. Fifteen test items of pulmonary function and chest direct radiography were selected. Diseases caused by organic mercury compounds are called Minamata disease. As the attentive points for diagnosis, 11 items for congenital Minamata disease, two items for the acquired disease, and three other items (visual field, eye ground, and exact hearing tests) are considered essential for examination. The disease caused by cadmium injury was called Itai-itai disease for which five diagnostic items and ten items, such as blood test, chest x-ray, and urinalysis were selected for necessary examination.

31224

Mustafa, Mohammad G., Carroll E. Cross, and Walter S. Tyler

INTERFERENCE OF CADMIUM ION WITH OXIDATIVE METABOLISM OF ALVEOLAR MACROPHAGES. Arch. Internal Med., 127(6):1050-1058, June 1971. 67 refs. (Presented at the Hanford Biology Symposium on Pollution and Lung Biochemistry, Annual, 10th, Richland, Wash., June 1970.)

The effects of a number of divalent cations, especially cadmium, on certain aspects of oxidative and energy metabolism of alveolar macrophages are reported. The pulmonary alveolar macrophages possess metabolic pathways operative predominantly in the aerobic environment. These cells consume 0.15-0.2 micromolar 02/mg protein/sec in vitro. Mitochondria from these cells show a respiratory rate of 0.5-0.6 micromolar 02/mg protein/sec for succinate as a substrate. Mitochondrial oxidation is coupled to phosphorylation; adenosine diphosphate: oxygen ratios are approximately two for flavin-linked and three for pyridine nucleotide-linked substrates. The cadmium ion adversely affects the respiration of alveolar macrophages. It completely inhibits macrophage mitochondrial oxygen uptake at 50 micromolar concentrations and uncouples oxidative phosphorylation at five micromolar concentrations. This and several other divalent cations, such as copper, mercury, strontium, and zinc, also inhibit the adenosine triphosphatase activity of alveolar macrophages. Since metal fumes and oxides are common air pollutants, a study of this sort may provide information on mechanisms, at the biochemical level, as to how toxic inhalants initiate pulmonary pathology. (Author abstract modified)

31280

TRACE METALS: UNKNOWN, UNSEEN POLLUTION THREAT. Chem. Eng. News, 49(29):29-30, 33, July 19, 1971.

Because no metal is degradable, toxic metals in the environment (such as cadmium, lead, nickel, tin, mercury, and arsenic) may be a more insidious problem than pollution by pesticides, sulfur dioxide, nitrogen oxides, carbon monoxide, and other gross contaminants. Public health experts are concerned that subtle physiological changes caused by trace metals may go completely undetected or, if detected, be attributed to other causes. The problem is how to detect harmful responses to very low doses of trace metals and how to differentiate adaptive responses from those representing the first stages of a disease. Also, synergistic and antagonistic relationships among trace metals must be defined. Until these questions and relationships are mor thoroughly explored, standards for trace metals in air, water, and food residue will be little more than guesses. Sources and health effects of some trace metals considered hazardous are summarized.

31543

Goulding, Roy

CONTAMINATION IN COUNTRYSIDE AND HOME. J. Roy. Coll. Physicians, 5(4):374-378, July 1971. 9 refs.

Without doubt, in a single, acute overdose, the organochlorine insecticides can be manifestly toxic, causing stimulation of the central nervous system and epileptiform seizures. This group of chemicals is inordinately stable both chemically and biologically. This is an advantage to an insecticide. However, this very persistence also leads to transfer throughout the food chain, from flora to fauna and from one creature to another, with a tendency to ultimate accumulation in carnivorous species. More recently, the use of organic mercury compounds as commercial fungicides has expanded enormously, and on the farm they remain unsurpassed. In Japan a few years ago, the geographically named Minamata disease provided an arresting outbreak of organic mercury poisoning in an island community. Certain organic arsenic compounds are widely used as growth promoters in the rations of farm livestock, and the possibility of an environmental accumulation thus emerges.

31624

Brune, Dag

LOW TEMPERATURE IRRADIATION APPLIED TO NEUTRON ACTIVATION ANALYSIS OF MERCURY IN HUMAN WHOLE BLOOD. Aktiebolaget Atomenergi (Stockholm), 7p., 1966. 11 refs.

The distribution of mercury in human whole blood has been studied by means of neutron activation analysis. During the irradiation procedure the samples were kept at low temperature by freezing them in a cooling device in order to prevent interference caused by volatilization and contamination. The mercury activity was separated by means of distillation and ion exchange techniques. The values from 20 samples were nearly consistent with a skew distribution; the median, amounting to 0.011 microgram/g, was consequently chosen to represent the central value. Expressed as the ratio of the highest and lowest values, the range of the mercury concentrations corresponded to a factor of eight. (Author summary modified)

31629

Eybl, V., J. Sykora, and F. Mertyl

THE INFLUENCE OF SODIUM SELENITE, SODIUM TELLURITE, AND SODIUM SULFITE ON THE RETENTION AND DISTRIBUTION OF MERCURY IN MICE. Arch. Toxikol., vol. 25:296-305, 1969. 20 refs. Translated from German. Mundus Systems, McGregor, and Werner, Washington, D. C., 11p.

The retention and distribution of mercury were studied in experiments with mice during a four week period following the intravenous administration of mercuric chloride (Hg--230) and the subcutaneous application of sodium selenite, sodium tellurite, and sodium sulfite. Both sodium selenite and sodium tellurite caused a long term retention of mecury in the organism and altered the distribution of mercury in the organs. Sodium sulfite did not influence mercury retention, and caused only insignificant changes in the distribution of mercury. The effect of these compounds depended upon the redox potentials. Sodium selenite and sodium tellurite are reduced in the organism, and form compounds of a colloidal nature with mercury which are retained in the organism. (Author summary)

31705

Bederka, John P., Jr.

ON THE TOXICITY OF OUR ENVIRONMENT. J. Med. Assoc. Thailand, 54(5):335-348, May 1971. 45 refs.

Environmental pollution is considered with respect to sulfur dioxide, smog nitrogen dioxide, carbon monoxide, particulates, and chlorinated hydrocarbons. Studies on the public health effects of atmospheric pollutants are summarized, as are studies on the metabolism of DDT and its effect on animals (on reproduction and mortality). Also noted are the increasing atmospheric concentrations of heavy metals such as mercury, beryllium, lead, copper, and cadmium. Also, the additive and/or synergistic effects of air pollutants are pointed out. Special attention is given to altered metabolic patterns produced by increasing levels of insecticides in the body and to the fact that lipid soluble organochlorine substances are concentrated in passing up the food chain.

32218

Jung, Fritz

THE PATHOLOGY OF ERYTHROCYTES. PART II. THE EFFECTS OF SOME METAL SALTS. (Zur Pathologie der roten Blutkoerperchen. II. Mitteilung. Wirkungen einiger Metallsalze). Text in German. Arch. Exp. Pathol. Pharmakol., vol. 204:139-156, 1947. 14 refs. Part I. Klin. Worchshr., p. 917, 1942.

The effects of zinc sulfate, and lead nitrate on isolated human erythrocytes was studied by means of an ultramicroscope and a potentiometer. High concentrations of mercury chloride caused fixation of erythrocytes and of erythrocytal stromata without significant optical structural changes. At lower HgCl2 concentrations, all degrees from the outside to the inward progressing fixation of cellular proteins were observed ultramicroscopically. Very low concentrations precipitated hemoglobin inside the cell with a simultaneous increase of osmotic resistance. Increasing concentrations brought about progressive hemolysis based on membranal denaturation. This was followed by a coagulation of the uppermost cellular layers coupled with a liberation of the central hemoglobin residue which can also form a circular coagulate within the fixated membrane. The minimal amount of sublimate per cell still causing hemolysis is about 1.2 times 0.00000001 molecules. In contrast in HgCl2, ZnSO4 and Pb(NO3)2 cause only increased rigidity of the membrane. Lead hydroxide and lead phosphate is adsorbed on erythrocytal membranes. The embedding of lead in the membrane can be observed ultramicroscopically.

32546

Fukuda, Katsuhiro

EXPOSURE MODE TO MERCURY VAPOR AND BODY BURDEN IN THE RAT AND ITS DECREASING PATTERN. (Ratto eno suigin joki no bakuro yoshiki to suigin no tainai bunpu narabini sono gensho pattern ni kansuru jikkenteki kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 26(2):257-263, June 1971.

Determinations were made of the mercury content in the tissues of rats exposed to mercury vapors. One group was exposed to 6.0 mg/cu m/hr, 3.0 mg/cu m/hr, and 1.5 mg/cu m/hr. Another group was exposed to 1.0 mg/cu m/6hr, 1.0 mg/cu m/3hr, and 1.0 mg/cu m/1.5hr. Each exposure was continued five days a week for two to four consecutive weeks. Quantitative mercury determination was performed by a dithizone method. Mercury concentration in the lungs was higher at the end of the period of exposure for those rats in the high concentration-short term exposure group than for those rats in the low concentration- long term group. However, other body tissues of rats in the first group had lower mercury concentrations than those in the second group. When the mercury content of the rats in the 1.0 mg/cu m/6hr group was measured for 16 weeks after the termination of mercury exposure, the mercury content was observed to decrease linearly on a semilogarithmic scales. The half time of mercury was about 13 days in the lung and about 210 days in the brain. (Author abstract modified)

32608

Fairhall, Lawrence T.

INORGANIC INDUSTRIAL HAZARDS. Physiol. Rev., 25(1):182-202, Jan. 1945. 191 refs.

The effects of long continued exposure to relatively low concentrations of inorganic metal compounds are discussed in connection with industrial hygiene. The diagnosis of lead poisoning may be difficult. The usual symptoms are colic, basophilic stippling of the erythrocytes, urinary excretion of lead palsy, and anemia. However, any one or several of these may be absent, and thus make diagnosis doubtful. Poisoning by mercury, where it is not acute, is slow and insidious and leads to impairmen of tissue functions. The symptoms of cadmium poisoning are increased salivation, choking attacks, vomiting, abdominal pain, diarrhea, and tenesmus. Manganese poisoning is relatively rare in industry; it is a crippling disease with permanent disability, particularly of the legs. The increased use of beryllium has led to several cases of severe poisoning. The effects of molybdenum and tungsten compounds are briefly discussed. Although antimony and arsenic are usually regarded as having comparable toxic qualities, the toxic effects of arsenic are believed to outweigh those of antimony. Antimonal poisoning does not appear to be an industrial disease of any consequence. Uranium and its salts are highly toxic. The absorption of small amounts over long periods of time causes a chronic nephritis. The effects of magnesium, zirconium, selenium, tellurium, vanadium, and chromates are also described.

32936

Goldwater, Leonard J.

MERCURY IN THE ENVIRONMENT. Sci. Am., 224(5):15-21, May 1971.

The natural cycle of circulation of mercury on the earth disperses it widely through the habitable spheres in trace amounts that pose no hazard to life. The use of cinnabar as a coloring agent and of mercury compounds in pharmaceuticals under careful control introduce no threat to the quality of the environment. With the development of other applications, however, particularly in industry and agriculture, serious problems have arisen. In Minamata Bay (Japan) the substances that had poisoned the fish and people were identified as methyl mercurials. The grain that caused outbreaks of illness and death among the farmers of Iraq had been treated with ethyl mercury p-toluene sulfonanilide, and alkyls of mercury were similarly incriminated in Sweden and other places. Alkyl mercury can cause congenital mental retardation, while recent laboratory studies have shown that it can produce abnormalities of the chromosomes, as well as cerebral palsy. Mercury has a strong affinity for sulfur, particularly for the sulfhydryl groups in proteins. Bound to proteins in a cell membrane, the mercury may alter the distribution of ions, change electric potentials and thus interfere with the movement of fluids across the membrane. There are also indications that the binding of mercury to protein disturbs the normal operation of structures such as mitochondria and lysosomes within the cell. The extent of man s exposure to mercury is considered, as well as his response to this threat. Mercury concentrations in the air and foods such as milk, meats, vegetables, eggs, and fruits have been measured.

33504

Battigelli, M. C.

MERCURY TOXICITY FROM INDUSTRIAL EXPOSURE. A CRITICAL REVIEW OF THE LITERATURE - PART I. J. Occupational Med., vol. 2:337-344, July 1960. 67 refs.

Data from animal experiments and observations of human cases are analyzed in relation to the variables of intake and subsequent handling by the body of mercury in different forms. Industrial exposures include the mining and refining of ore containing cinnabar (mercurous sulfide); the manufacture of felt hats, technical instruments, carbon brushes for electrical equipment, and certain fluorescent lamps; and the use of mercury paints. The degree of intoxication produced by mercury is determined by the amount and rate of absorption,

physiochemical properties of the absorbed compound, and individual susceptibility. Neither the amount of mercury that constitutes a harmful total body burden nor the amount that is safely tolerated is known with satisfactory precision for humans. The metabolism of mercury in the blood, brain, kidney, liver, and intestine is discussed. It is known that mercury develops chemical associations with various substances in the blood. There is a poor correlation between the amount of mercury localized in a given tissue and pathological changes. The matter is further complicated by the fact that mercury may be found in impressive concentrations in the tissues of persons with no identifiable intake of this substance. The diuretic effect of mercurials stems from their inhibition of succinic dehydrogenase within kidney cells. The ultimate effect of mercury and its compounds is very probably based on the capacity of these substances to inhibit enzymes.

33868

Tejning, Stig

THE PROBLEM OF MERCURY IN SWEDEN. (Kvicksilverfragen i Sverige). Preprint, Swedish Dept. of Agriculture, 1965, p. 80-91. Translated from Swedish. Scientific Translation Service, Santa Barbara, Calif., 19p. (Presented at the Swedish Department Agriculture, Conference on Mercury, 1965.)

The effects of metallic quicksilver, an inorganic mercury salt, and the alkyl mercury compounds are compared. In 1953, cases of a mysterious nervous disease began to appear among the population of the city of Minamata, Japan. The suspicion that it could be alkyl mercury poisoning was confirmed when the patients were found to be excreting mercury in their urine for the first five months after becoming ill. Further investigation revealed that a chemical plant which used mercury compounds as catalysts had released waste products into the Minamata Bay, and several types of fish subsequently were found to have a high mercury content. Feeding experiments were conducted with six month old white leghorn hens which were given 12.5, 25, and 50% Panogen treated grain. In the groups whose feed contained 25 and 50% Panogen, both food consumption and egg production decreased. Alkyl mercury poisoning in wild pheasants is also discussed.

34621

Bittersohl, G.

EXPOSURE TESTS FOR EVALUATION OF THE FITNESS. (Die Durchfuehrung von Expositionstests fuer die Beurteilung der Tauglichkeit). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 17(10):727-730, Oct. 1971.

Exposure tests are necessary for determination of the fitness of workers operating in a polluted surrounding. They have even greater importance nowadays, since atmospheric pollution may have already affected the worker before he starts his work. Urine samples are of lesser value, since the collection of a 24-hour sample is hardly feasible in practice. Moreover, for many pollutants, such as mercury, no direct relationship between discharge quantity and blood or organ level exists. For many pollutants the examination of the saliva is of importance, such as bromides. Many pollutants are discharged again by expiration, for example, gases or solvents. The analysis of the expired air is still in a trial state. Measuring the carbon monoxide concentration in the expired air by a breathing bag, test tube, or chemical and physical methods seems to be promising. The best information is gained by analysis of body fluids and organs, such as blood and serum. For metals and metalloids, hair and finger nails are important storage places. The most accurate method is the CO determination according to the Uras principle. Of great value are tests which confirm the reaction of an organism with the pollutants, such as the delta-aminolaevulinic acid discharge in the urine and methaemoglin formation.

34682

Adamo, Mario

TOXICITY OF MERCURY VAPORS UNDER VARIOUS ENVIRONMENTAL CONDITIONS. (La tossicita dei vapori di mercurio in deverse condizioni ambientali). Text in Italian. Rass. Med. Ind., vol. 10:684-690, 1939. 7 refs.

Guinea pigs kept in confined and humid environments, and subjected to inhalation of mercury vapor for two hours daily, quickly (after three-seven hours of treatment) grew sick and died. Toxicity was practically absent in guinea pigs subjected to inhalation of Hg vapors in dry and well ventilated environments, for as long as 50 hours. The results suggest that the fast toxic action exerted by the Hg vapors when inhaled in humid environments is actually due to the indirect effect of carbon monoxide. The latter, being soluble in water, is easily absorbed by the animals; accordingly, it induces respiratory stimulation and a subsequent fast rate of absorption of the agent being tested. Work areas contaminated with Hg vapors should be well ventilated and dry in order to protect the health of the workers.

34756

Neal, Paul A.

MERCURY POISONING FROM THE PUBLIC HEALTH VIEWPOINT. Am. J. Public Health, 28(8):907-915, Aug. 1938. 9 refs. (Presented at the American Public Health Association, Annual Meeting, 66th, New York, Oct. 5, 1937.)

Principal industrial sources include mining, chemical processing, and the manufacture of felt hats, electrical equipment, pharmaceuticals, photography supplies, and explosives. Mercury can enter the body by inhalation of vapor or finely divided dust, by ingestion, through the skin, and through the subcutaneous tissues. The symptomatology of chronic mercurialism falls into two types, one with stomatitis, colitis, and nephritis predominating, and the other with tremor and other neurological symptoms most characteristic. The quantity of mercury in the air sufficient to cause chronic mercurialism cannot be definitely stated. Age, sex, individual susceptibility, and the physical condition of the individual play some part in determining the reaction to mercury-vapor exposure. The prevention of industrial mercurialism consists primarily in avoiding the inhalation of mercury vapors and dusts. This is an engineering as well as a medical problem, requiring special local exhaust ventilation, good natural and mechanical ventilation, good housekeeping, general sanitation, and in certain occupations, positive pressure masks.

34789

Witschi, Hanspeter

DESORPTION OF SOME TOXIC HEAVY METALS FROM HUMAN ERYTHROCYTES IN VITRO. Acta Haematol., vol. 34:101-115, 1965. 21 refs.

Human red cells were incubated in vitro with lead-210, mercury-203, and thallium-204 and thereafter washed repeatedly with different washing liquids; the desorption of these metals from the erythrocytes was determined. Lead was removed from the erythrocytes to a greater extent by repeated washings in their own plasma than in pure inorganic medium. In a heterogenous mixture of alpha- and beta-globulins including lipoproteins, even more lead was desorbed from the cells than in plasma, albumin or gamma-globulin solutions. It is supposed, there-

fore, that lead is bound at least partly to the deeper layers of the plasma protein film on the erythrocytic surface. On the other hand, mercury was observed to be rather fixed to lipoproteins, lipids, and/or smaller thiols of the outer surface. Thallium apparently shows no definite predilection to binding sites either in the plasma or in cells.

H. EFFECTS-PLANTS AND LIVESTOCK

17710

Thomas, Moyer D. and Russel H. Hendricks

EFFECT OF AIR POLLUTION ON PLANTS. In: Air Pollution Handbook. P. L. Magil, F. R. Holden, and C. Ackley (eds.), New York, McGraw Hill, 1956, Sect. 9, 44p. 129 refs.

The effects of sulfur dioxide, hydrogen fluoride, chlorine, hydrogen chloride, nitrogen oxides, ammonia, hydrogen sulfide, hydrogen cyanide, mercury, ethylene, and pesticides on plants are surveyed, with special attention to effects on alfalfa, barley, and wheat. Damage to crops in Los Angeles County has been estimated at $500,000 yearly. The toxicity of sulfurous acid is attributed more to its reducing properties than to its acidity. (It is 30 times as toxic as sulfuric acid.) Analysis of plants for total sulfur and sulfate sulfur is a possible method of diagnosing sulfur dioxide injury. The relative sensitivities to sulfur dioxide of 90 cultivated plants and 29 native plants are given (alfalfa sensitivity equals 1.0). Time-concentration and yield-leaf-destruction equations are discussed. Hydrogen fluoride is poisonous to gladiolus and iris, to various types of grain, to pines and other coniferous trees, and some fruit trees. Susceptibility varies widely, even among species of the same plant. Some varieties of gladiolus are highly susceptible; others are highly resistant. Coal smoke as a source of atmospheric fluoride should not be neglected. Fluoride content of certain types of coal can be high as 295 ppm. In areas near Pittsburgh, readings of as high as 269 ppm of fluoride have been registered in tree leaves, and 53 ppm in grass. The effect of smog on plants is discussed, including a tabulation of the sensitivity of 47 plants cultivated in southern California and of 52 plants native to the area. The chemical composition of smog is also analyzed.

19770

Dieman, et al.

ON THE ACTION OF MERCURY ON VEGETABLE LIFE. (Sur l'action due Mercure sur la vie vegetale). Anal. Chem., vol. 22:122-127, 1797. Translated from French. Belov and Associates, Denver, Colo., 4p., June 2, 1970.

Several experiments were conducted to determine the effects of mercury and mercury oxide on plants. When mint and bean plants were placed next to a bottle of mercury, the leaves and stems were covered with black spots on the third day, and then turned completely black. A mint plant and mercury were placed under a bell-glass whose sides were coated with sulfur. The plant remained intact, indicating that sulfur prevents the harmful effects of mercury. No damage was observed when the mercury was covered with water. The experiments also showed that mercury is not harmful unless it is mixed with water or soil, or is in contact with the roots of the plants. Mercury oxide killed a mint plant when placed in contact with the roots. Beans planted in soil mixed with mercury oxide became feeble and disfigured; beans planted in a mixture of soil and lead oxide continued to grow and were four times as strong as those grown in soil and mercury oxide.

20158

Zimmerman, P. W.

CHEMICALS INVOLVED IN AIR POLLUTION AND THEIR EFFECTS UPON VEGETATION. Proc. Governor's Conf. Exhibit Atmospheric Pollution New Jersey, 1952, p. 23-31. 33 refs. (Feb. 19-20.)

Results of studies on the effects of various gases on plants are summarized for sulfur dioxide, hydrogen fluoride, chlorine, hydrogen sulfide, ammonia, mercury vapor, ethylene and carbon monoxide, and the vapors of 2,4-D and other hormone-type chemicals. Measurements of the atmosphere at Yonkers, New York, show an average of 0.01 ppm of SO2 for 62% of the year. A maximum concentration of 0.75 ppm occurred in January. Leaves of alfalfa and buckwheat exposed to a concentration of 0.40 ppm for 7 hours became spotted. Working with concentrations of 0.1-0.2 ppm of SO2, the following observations were made: there is more SO2 resistance at or below 40 F, and SO2 sensitivity does not change with minor variations in soil moisture. The sulfate content of the nutrient supply did not affect sensitivity, although the growth rate of sulfur-defficient plants increased under fumigation with 0.1-0.2 ppm SO2. Plants recover between treatments if these are sufficiently spaced. Sensitivity was not affected by wetting the leaf surface. Young plants are more resistant than old plants; older leaves are more resistant than younger ones. HF gas tends to injure the margin of the leaf more frequently than SO2. Application of sodium fluoride to soil caused similar injuries to those induced by HF fumigation H2S gas is less toxic than the other gases tested, and injured the younger rather than the older leaves. Substituted phenoxy acids are extremely selective, stimulating growth in some plants and injuring or deforming others.

21691

Heck, Walter H., Robert H. Daines, and Ibrahim J. Hindawi

OTHER PHYTOTOXIC POLLUTANTS. In: Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas. Jay S. Jacobson and A. Clyde Hill (eds.), Pittsburgh, Pa., Air Pollution Control Assoc., 1970, p. F1-F24. 54 refs.

The effects of several phytotoxic pollutants are considered. Ethylene acts as a growth hormone; it causes a reduction in growth, stimulates lateral growth, and decreased apical dominance. Plant leaves may develop epinasty or show chlorosis, necrosis, or abscission. Injury from oxidants other than ozone, PAN, or nitrogen dioxide may be chronic or acute. These oxidants, none of which have been identified, may cause necrosis, collapse of leaf tissue, and dehydrated and bleached lesions. Cotton leaves affected by herbicides show a yellow-green mottling or stippling and vein clearing may be pronounced. Tomatoes may show epinasty and twisting of plant parts. Arsenic trioxide injury on sensitive fruit and vegetable crops produces necrotic spots on the leaves, petioles, twigs, and fruits. Mild to severe interveinal necrosis and chlorosis may occur on broad-leaved plants as a result of atrazine. Necrosis, chlorosis, and epinasty are the common symptoms of chlorine injury. Acute tissue collapse and

necrotic spotting have resulted from ammonia injury. Discoloration of peach and apple fruits have also been reported. Hydrogen chloride caused an acid-type necrosis. Tipburn to fir needles and necrosis along leaf margins have also been noted after HCl exposures. Mercury causes chlorosis, abscission of older leaves, growth reduction, and general poor growth and development. The effects of particulates, hydrogen sulfide, and carbon monoxide are briefly discussed.

22952

Boussingault, M.

PLANT PHYSIOLOGY- ON THE DELETERIOUS ACTION THAT THE VAPOR EMANATING FROM MERCURY EXERCISES ON PLANTS. (Sur l'action deletere que la vapeur emanant du mercure exerce sur les plantes). Compt. Rend., vol. 64:924-929, 1867. 2 refs. Translated from French. Belov and Associates, Denver, Colo., 9p., March 12, 1970.

The effects of mercury vapor on plants were investigated. When a mercury-filled capsule was placed on each side of a petunia stem, the leaves turned black, withered, and were hanging. Another petunia, enclosed under a dish-cover where there was no mercury, retained all its vigor. Experiments were also conducted on mint plants. On the inner surface of one dish-cover sulfur was placed on the flower. In the other dish cover there was no sulfur. In less than 52 hours, the mint leaves in the dish containing only mercury had been completely destroyed. The leaves of the plant in the dish also containing sulfur were not affected. It was concluded that mercury vapor has a damaging effect on vegetation, and that the presence of sulfur counteracts this effect.

23436

Ruhling, Ake

HEAVY METALS IN THE REGION OF VARGON-TROLLHATTAN. II. ARSENIC AND MERCURY. (Tungematallfororeningar inom Vargon- Trollhattanomradet. II. Arsenik, Kvicksilver). Text in Swedish. Lund Univ. (Sweden), Inst. of Ecological Botany, Rept. 15, 8p., May 1970.

Arsenic and mercury were measured in a common moss, Hypnum cupressiforme, in the region of Vargon-Trollhattan, Sweden. Three samples were taken from each of 127 sites, all more than 100 m from any road. The region studied is highly industrialized with iron, steel, and ferro-alloy industries. No exceptionally high values were observed.

23696

Crocker, William

EFFECT OF CERTAIN LETHAL GASES UPON PLANTS AND ANIMALS. In: Growt of Plants, New York, Reinhold Publishing Corp., 1948, Chapt. 5, p. 172-203. 43 refs.

The effects of various toxic gases on plants and animals are discussed. Ethylene is the constituent of artificial illuminating gas that injures plants in greenhouses when this gas seeps through the soil and into the houses. Hydrocyanic acid is the most deadly constitutent of artificial illuminating gas to plants growing outdoors near leaking gas pipes. Most natural gases have very low toxicity to plants because they contain no ethylene or other unsaturated hydrocarbons, and no HCN or other highly toxic gases. Some natural gases contain H2S which might injure plants if the gas were not thoroughly scrubbed. Mercuric chloride, calomel, or organic mercury fungicides mut be used with caution on soils in greenhouses or other enclosed spaces because the soils reduce these compounds to metallic mercury which has sufficient vapor pressure, especially at higher growing temperatures, to injure plants throughout the enclosed space. The most delicate plants are injured by 0.46 ppm of sulfur dioxide with seven hours' exposure. Animals endure 33 ppm for 500 hours without injury. Sulfur dioxide kills the leaf parenchyma of the medium-aged leaves, thus cutting down assimilation, but there is no reduction of assimilation or growth if no tissue is killed, that is, there is no 'invisible injury.' Darkness and partial wilting increase the resistance of plants to SO2, partly at least by closing the stomates. Hydrogen sulfide differs from SO2 in several ways as to its effect upon plants; it requires a much higher concentration to injure plants, 40 to 400 ppm; it kills the young leaves and stems rather than spotting middle-aged leaves, and its toxicity is not so greatly reduced by darkening and by wilting the plants. Chlorine acts much like SO2 on plants and spots them in even lower concentrations Chlorinated water has relatively low toxicity for land plants when used either for syringing or watering them. By use of the continuous air-flow method, a study was made of a relative sensitiveness of plant and animal pathogens, sclerotia, seeds, green plants, and houseflies, rats and mice to the five gases, Cl2, HCN, H2S, NH3, and SO2. Chlorine and SO2 showed high toxicity to pathogens and other gases low toxicity. Sclerotia and seeds were little injured by any of the gases. Green leaves were very sensitive to these gases, and the gases showed the following descending order of toxicity: Cl2, SO2, NH3, HCN, and H2S. Green stems were more resistant than leaves, with no significant difference in the degree of toxicity of the five gases. Animals were readily killed by HCN and H2S and the descending order of toxicity for animals was HCN, H2S, Cl2, SO2, and NH3.

24773

Richter, Oswald

PLANT GROWTH AND LABORATORY ATMOSPHERE. (Pflanzenwachstum und laboratoriumsluft). Ber. Deut. Botan. Ges., vol. 21:180-194, 1903. 35 refs. Translated from German. Belov and Associates, Denver, Colo., 29p., June 10, 1970.

A series of experiments designed to determine the effect of reduced oxygen or increased carbon monoxide on plant growth is described. The results of the experiments indicate that gaseous impurities in the atmosphere may have significant effects on the rate of plant growth. Another series of experiments is conducted to determine the specific effects of coal gas, particularly acetylene and ethylene, on the growth of certain vegetables. The results indicate that coal gas has an inhibiting effect on the growth in length and that it promotes the growth in thickness. A simple gas absorption system utilizing charcoal decreases the influence of coal gas. The shortening and thickening of affected plants is proportional to the amount of coal gas and to the duration of exposure. The effects of reduced oxygen partial pressure and plant respiration on plant growth include nutations of 130-270 deg. Mercury vapor can produce similar differences in growth as coal gas, however, it kills the plants within a short time.

25826

Berg, H.

HYDROCHLORIC ACID. BROMINE. IODINE. HYDROGENCYANIDE. ETHYLENE. CARBONMONOXIDE. MERCAPTANS. COAL GAS. ASPHALT- AND TAR-VAPORS. SATURATED HYDROCARBONS. ACETIC ACID. 2,4-DICHLOROPHENOXY-ACETIC ACID. MERCURY. SELENIUM. SMOKE AND FOG. In: Phylotescische Immissionen. Berlin, Parey, 1963. p. 51-71. Translated from German. 35p.

Occurrence of the contaminant, its macroscopic and microscopic damage to plant organs, its mode of action, and its

diagnosis are summarized, along with differences in resistance among plants for the following: hydrochloric acid, bromine, iodine, hydrogen cyanide, ethylene, carbon monoxide, mercaptans, coal gas, asphalt and tar vapors, saturated hydrocarbons, acetic acid, 2,4-dichloro-phenoxy-acetic acid, mercury, selenium, smoke and fog, and sulfuric acid.

25927

Hajduk, J. and M. Ruzicka

THE STUDY OF DAMAGES CAUSED BY AIR POLLUTION TO LIVE PLANTS AND PLANT COMMUNITIES. (Das Studium der Schaden an Wildpflanzen und Pflanzengesellschaften verursacht durch Luftverunreinigung). Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 183-192. Translated from German. Belov and Associates, Denver, Colo., 13p., Nov. 4, 1970.

A review of the literature is provided concerning the influence of air pollution on wild plants and vegetation. Such studies are recommended in order to predict the influence of toxic emissions of new industries upon the landscape. Examination of individual species is also essentiai to determine their resistance and whether or not they are indicators of pollution. Studies were made in the Institute for Landscape Biology in Bratislava of the effects magnesium oxide, sulfur dioxide, mercury, and other toxic materials have upon vegetation. The directions which research should take with regard to protecting the landscape are indicated.

27872

Utagawa, Tatsuo

EFFECTS OF ENVIRONMENTAL POLLUTIONS ON BIRDS AND ANIMALS. (Kogai ni yoru choju no eikyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), (1):35-39, Jan. 1971.

The lives of wild birds and beasts are being threatened because of the destruction of their habitats, as development of those areas progress, and because of pollution from chemical matter, especially from insecticides and herbicides. It is possible that such birds as the albatross, and others, may be accumulating radioactivity. Even in a vast area of the USSR, many wild birds and beasts are dying because of dichloro-diphenyl-trichloro-ethane (DDT). There are only two storks in Japan, since they started to lay eggs which did not hatch because of mercury poisoning. Benzene hexachloride (BHC) and DDT have the same effect on eggs of birds. In the natural habitat of herons near Tokyo one can now see only 2000 herons, although at one time there were 50,000. While the adult herons have to fly increasingly further distances to seek food, the chicks are suffering from swollen knee joints, due to accumulation of chlorine or organic phosphorous chemicals. Swallows are dying, also, because they eat insects on which insecticides were sprayed. The same fate has overtaken crows and kites, as well as herons. Even though DDT and BHC are now forbidden, other chemicals, used for agricultural purposes are poisoning birds. Water foul are being affected by waste oil and detergents. Foxes, weasels, and martens, the natural enemies of wild rabbits, died because they ate rats which were poisoned with rat poison. People engaged in the forestry industry are careful of using chemicals which might cause this sort of secondary damage, but the people in agriculture still use these kinds of chemicals. In Japan, BHC and DDT are controlled, but are entirely forbidden, as in the case of the U. S. Monkeys are being starved because of herbicides. There have been cases of cattle and horses which died because of herbicides. Deer and antelopes are also being threatened. The citizens of Ichikawa City succeeded in getting the Chiba Prefectural Government to spend approximately 2,800,000 to make an artificial island to offer a haven for migratory birds. The wild life in the forests of Mt. Fuji is being rapidly destroyed because of a newly constructed road which takes the sightseers to the middle slope of the mountain. It is emphasized that private citizens can cooperate by planting even one tree in their gardens.

28849

Zimmerman, P. W. and William Crocker

PLANT INJURY CAUSED BY VAPORS OF MERCURY AND COMPOUNDS OF MERCURY. Contrib. Boyce Thompson Inst., 6(1):167-187, Jan.-March 1934. 6 refs.

Experiments were performed to determine the effect of vapors of mercury and its compounds on growing plants when exposed under various conditions. Treating one bed of soil in a rose house with bichloride of mercury injured flowers of Briarcliff variety over the entire range, showing that the plants were attacked by some inpurity in the air. Flower buds of roses in all stages of development were affected by the vapors emanating from soil treated with bichloride. Peduncles of very young buds turned yellowish and then black; half mature buds turned brown, and the corollas abscissed from the receptable without opening; the older buds continued to unfold but the petals lacked the pink color characteristic of Briarcliff variety and brown patches finally developed; stamens also were injured, turning nearly black in half mature buds. Leaves of rose plants confined in glass cases with treated soil were injured as well as flower buds. Plants of 65 different genera were found susceptible to injury from vapors emanating from soil or tankage moistened with bichloride solution. Ten types were found to be comparatively resistant. The injury to plants from vapors from metallic mercury was similar to that caused by vapors emanating from soil treated with bichloride. Thirteen other compounds of mercury affected plants as reported for bichloride; of these six were organic, and seven inorganic. The extent of the injury and the rate at which metallic mercury injured plants varied with the concentration of th vapor in the air and this in turn varied with the temperature. Vapors from soil treated with mercury compounds injured plants more quickly at high than low temperature. In general, the amount of injury at a given temperature could be correlated with mercury vapor pressure at the same temperature. Metallic mercury vapor was detected in the air surrounding soil treated with the mercury compounds, indicating reduction to the metallic state. Mercury was recovered from leaves of plants confined in glass cases where a small amount of soil had been moistened with a solution of bichloride. (Author summary)

29147

Byrne, A. R. and L. Kosta

STUDIES ON THE DISTRIBUTION AND UPTAKE OF MERCURY IN THE AREA OF THE MERCURY MINE AT IDRIJA, SLOVENIA (YUGOSLAVIA). Vestn. Sloven. Kem. Drustva, 17(1/4):5-11, 1970. 5 refs.

Results are presented of a preliminary investigation of the mercury content of environmental samples, primarily of various water, soil, and plant samples, in the neighborhood of the mercury mine at Idrija, Yugoslavia. The measurement technique was activation analysis using a volatilization method for mercury separation. Results show a wide range from apparently normal background (0.005-0.1 ppm) to very high levels (10-100 ppm). The highest values are mainly due to aerial contamination from the mine flue gases. More importantly, the results show the ability of vegetation to accumulate mercury during growth. (Author abstract)

33046

Byrne, A. R., M. Dermelj, and L. Kosta

A NEUTRON ACTIVATION STUDY OF ENVIRONMENTAL CONTAMINATION AND DISTRIBUTION OF MERCURY IN ANIMALS AND FISH. International Atomi Energy Agency, Vienna (Austria), Nucl. Tech. Environ. Pollut., Proc. Symp., Salzburg (Austria), 1970, p. 415-427. 11 refs. (Oct. 26-30, Paper IAEA-SM-142a/24.)

A program was undertaken to determine the uptake and distribution of mercury in the biosphere around the mercury mine and distillation plant at Idrija, Yugoslavia, in order to establish tolerance levels and the possibility of the adaptation of living organisms to its increased concentration. Two sampling sites were chosen, one near the main discharge point for the flue gases of the distillation plant, and the second in an area where ore deposits occur on or near the surface. The initial samples consisted of excreta, as well as of the fur and feathers of rabbits, hens, and cows. Eggs and milk were also analyzed at different periods of the year. In another set of experiments, rabbits were taken to an uncontaminated area and the mercury content of the blood and excreta were tested for 50 days. Trout were also taken from the river above, and at two sites below, where residue deposits from the mercury mine come into contact with the river water. Neutron activation analysis was used to determine the mercury content of samples. Kidney, liver, brain, and heart, samples were also tested. (Author abstract modified)

348810

Johnels, A. G. and T. Westermark

MERCURY CONTAMINATION OF THE ENVIRONMENT IN SWEDEN. In: Chemical Fallout. Morton W. Miller and George G. Berg (eds.), Springfield, Ill., Charles C. Thomas, 1969, Chapt. 10, p. 221-239. 21 refs.

Mercury and mercury compounds have a wide use in agriculture and industry, and an increase in natural levels of mercury content has been recorded. The mercury content in feathers of 11 terrestrial bird species, particularly goshawks, was studied by activation analysis, in material derived from museum collections and living or freshly killed birds and covering a period of more than 100 years. Nearly constant mercury levels were found from the middle of the 19th century until 1940. After that, an increase in mercury concentration occurs, amounting to at least 10 to 20 times the previous level. In 1940 alkylmercury compounds began to be used as seed dressings, indicating that this is the main source of terrestrial contamination. Activation analysis of the mercury content in axial musculature of the pike was used to estimate the level of mercury in the aquatic environment. The mercury concentration factor in pike is 3000 or more. There are indications that mercury appears as an airborne pollutant, mainly affecting the aquatic environment. A number of sources of mercury contamination including fuel burning, fertilizing, and industrial processes, are discussed; in many areas human activities have raised the mercury level of the environment far above natural levels. (Author abstract modified)

K. STANDARDS AND CRITERIA

05940

V. A. Ryazanov

NEW DATA ON LIMITS OF ALLOWABLE ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp. 1-8. (1962). Russ. (Tr.)

This volume contains material discussed by the Committee on Sanitary Air Protection during its 1959 and 1960 sessions. The material contained in this volume is of heterogenous character in its methodological presentations and completeness and finality of the reports. The Committee took the position that the level of methodology reached during the last period of investigation and the degree of reliability of results obtained did not represent the acme of perfection, and therefore, the proposed limits of allowable concentrations should be regarded as mere points of orientation for future studies, leading to more basic, more scientific and hence, more reliable limits of atmospheric air pollutants. In this connection it is the aim and purpose of this Committee to act as the stimulator, guide and directing agent leading into investigational channels based on the outlined principles. Air pollutants studied include formaldehyde, HCl aerosol, CS2 vapor, Mn, Hg, combined Cl2 and HCl gas, acetone, CO and Dinyl (mixture of diphenyl and diphenyl oxide).

06677

E. V. Khukrin

MODERN APPROACH TO AIR DUSTINESS IN WORKSHOPS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 301-8, 1962. (Gigiena i Sanit.,) 24 (7) 50-5, 1959. Translated from Russian. CFSTI: 62-11103

Extensive data were accumulated during recent years on the study of the effect of different types of industrial aerosols. Based on the summary and evaluation of new data obtained from work institutes, university apartments and practicing physicians a list was prepared of the maximum permissible concentration of 55 dusts and aerosols. This list is presented and improvements in those standards are recommended.

07576

Shakhbazyan, G. Kh. and I. M. Trakhtenberg

HYGIENIC STANDARDS AND SAFETY CRITERIA FOR ENVIRONMENTAL FACTORS IN INDUSTRY. (O gigienicheskom normirovanii i kriteriyakh bezurednosti faktorov proizvodstvennoi sredy.) Text in Russian. Gigiena i Sanit., 30(9), Sept. 1965. 15 refs. Engl. transl. by Israel Program for Scientific Translations, Hyg. Sanit., 30(9):328-336, Sept. 1965. CFSTI: TT66-51033/3

The principles governing the determination of hygienic standards for the factors of industrial environment are discussed. The necessity of differential substantiation of hygienic standards for various factors closely related to the everyday life of man and for factors whose action is undesirable and harmful in the environment of man is also discussed. On the basis of the work done at the Occupational Hygiene Department of the Kiev Medical Institute certain data are presented on the criteria that may evaluate the harm and safety of the investigated effects. Interpretation of the experimental findings on the effect of toxic substances of the immunobiological reactivity, the protein metabolism and the cardiac functioning is given. The relationship of specific and nonspecific reactions of the body in reply to the action of toxic substances is analyzed.

21133

Kurnosov, V. N.

BASIC DATA FOR THE HYGIENIC DETERMINATION OF LIMITS OF ALLOWABLE MERCURY VAPOR CONCENTRATION IN ATOMSPHERIC AIR. In: Limits of Allowable Concentrations of Atmospheric Pollutants. V. A. Ryazanov (ed.), Book 5, Washington, D. C., U. S. Public Health Service, March 1962, p. 39-51. 22 refs. (Translated by B. S. Levine.)

Experiments on the effects of mercury inhalation by rats are described, and previous investigations of mercury toxicity are reviewed. Also included is a summary of symptoms of mercury poisoning on humans under industrial conditions. The major sources of atmospheric mercury vapor emissions are plants producing mercury and plants which use it as a raw or supplemental material, such as chemical and pharmaceutical industries and factories producing light bulbs. It is also used in large quantities in the substations of certain electric transportation systems. Experimental exposure of animals to 2-5 micrograms/cu m of mercury vapor, a level frequently occurring in the atmospheric air around industrial enterprises, produced such changes in the higher nervous activity as functional disturbances in the brain cortex and diffuse protective inhibition. Concentrations of 0.3 micrograms/cu m elicited no changes; therefore the present 0.3 allowable limit of mercury concentration in atmospheric air is considered valid until more thorough studies prove otherwise. It was found that 10 micrograms/cu m of mercury in the air of working premises can cause chronic poisoning and that 8-10 and 2-5 micrograms/cu m used experimentally elicited notable functional changes in the higher centers of the nervous system. Therefore, it is recommended that the present occupational MAC of 10 micrograms/cu m be reduced. (Author conclusions modified)

28466

Lebedev, Yu. D., M. K. Nedogibchenko, and L. F. Glebova

CERTAIN RESULTS AND IMMEDIATE PROBLEMS OF HYGIENE SCIENCE AND SANITARY PRACTICE IN THE AREA OF PROTECTING CITY AIR. (Nekotoryy itogi i blizhayshiye zadachi gigiyenicheskoy nayki i sanitarnoy praktiki v oblasti okhrany atmosfernogo vozdukha gorodov). Text in Russian. Gigiena i Sanit., 21(11):3-8, 1956.

Maximum allowable concentrations have been established for a number of air pollutants as follows (single and daily-average values, respectively, mg/cu m): sulfur dioxide, 0.50, 0.15; chlorine, 0.10, 0.03; hydrogen sulfide, 0.03, 0.01; carbon disulfide, 0.50, 0.15; carbon monoxide, 6.0, 2.0; nitrogen oxides,

0.50, 0.15; non-toxic dust, 0.50, 0.15; soot, 0.15, 0.05; phosphorus pentoxide, 0.15, 0.05; manganese and manganese compounds, 0.03, 0.01; fluorine compounds, 0.03, 0.01; sulfuric acid, 0.30, 0.10; phenol, 0.30, 0.10; arsenic (inorganic compounds other than arsine), 0.003; lead and lead compounds (other than tetraethyl lead), --, 0.0007; and metallic mercury, --, 0.0003. Major administrative and technical problems associated with air pollution control in 1956 are reviewed.

34100

Love, G. J.

AIR POLLUTION INFORMATION PERTINENT TO THE CARIBBEAN. Preprint, Environmental Protection Agency, Research Triangle Park, N. C. and American Inst. of Chemical Engineers, New York, 29p., 1971. (Presented at the Technical Environmental Conference, 1st, San Juan, Puerto Rico, 1971.)

National primary and secondary ambient air quality standards are given for sulfur dioxide, particulates, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen dioxide. The primary standards define air quality levels judged necessary, with an adequate margin of safety, to protect public health. The secondary standards define levels necessary to protect public welfare from any known or anticipated adverse effects of a pollutant. Also included are initial lists, issued by the Environmental Protection Agency, of hazardous substances for which no ambient air quality standard is applicable and of five categories of stationary sources that contribute significantly to atmospheric pollution. Emission standards are to be promulgated for the hazardous substances (asbestos, beryllium, mercury) and for the stationary sources (contact sulfuric acid plants, large fossil fuel-fired steam generators, nitric acid plants, Portland cement plants, and incinerators of more than 2000 lb/hr charging rate. By regulating population growth, industrial development, and number of automobiles, the Caribbean could control pollution problems before they get out of hand.

34664

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

BACKGROUND INFORMATION - PROPOSED NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS: ASBESTOS, BERYLLIUM, MERCURY. Pub - APTD-0753, 28p., Dec. 1971. 20 refs. NTIS: PB 204876

Background information on the derivation of proposed national emission standards for asbestos, beryllium, and mercury is examined with respect to effects of the pollutants on health, nature of the air pollution problem, and the development and economic impact of the proposed standards. Standards for asbestos emissions are expressed in terms of required control practices that limit emissions to an acceptable level. The proposed beryllium standards are designed to protect the public from 30-day average atmospheric concentrations greater than 0.01 microgram/cu m. For short-term periodic exposures, the safe level was determined at 25 microgram/cu m for a 30-minute maximum. Proposed emission standards for mercury should not exceed an average daily concentration of 1.0 microgram/cu m. Atmospheric dispersion estimates used to develop the proposed standards are outlined. These were based on parameters of average wind speed, stability, and wind direction.

L. LEGAL AND ADMINISTRATIVE

12423

Lutz, G. A., S. B. Gross, J. B. Boatman, P. J. Moore, R. L. Darby, W. H. Veazie, and F. A. Butrico

DESIGN OF AN OVERVIEW SYSTEM FOR EVALUATING THE PUBLIC-HEALTH HAZARDS OF CHEMICALS IN THE ENVIRONMENT. VOLUME II. THE OVERVIEW SYSTEM. (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio Columbus Labs., Contract PH-86-66-165, 87p., July 18, 1967. 8 refs.

An overview system was designed that would assist in maintaining a continuous surveillance of chemical contaminants in the environment. To assess properly the difficulties and problems that would confront a surveillance program, as well as provide data on the operation of such a system, five specific chemicals or groups of industry were selected. These included mercury, nickel, vanadium, fluorocarbons, and the chemicals involved in the pulp and paper industry. Information needs were found to fall into five categories: chemical production, secondary product formulation, pattern of chemical usage, chemical toxicology and pharmacology, and environmental health hazards. Four separate features were recognized as essential to an overview center: a good scientific library and information-handling capabilities, ready and convenient access to large pools of scientific competence, an organizational solution for integration of information, and strong managerial ability. The total program for a comprehensive overview of chemical threats to environmental health was judged to require 187 professional man-months of effort plus consultant assistance. It was recommended that an overview center be established within an existing institutional structure possessing the qualifications necessary to provide both information-analysis specialties and a significant multidisciplinary block of professional scientists to immediately provide an internal core for the center. The necessary components of the center itself were identified. The requirements, costs, and recommended methods of operation of the total overview programs were discussed. (Author summary modified)

23116

Hashimoto, Michio

THE PRESENT STATE OF POLLUTION IN JAPAN. (Wagakuni ni okeru kogai no genjo). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 10(2):1-5, Jan. 15, 1970.

Pollutions in Japan are reviewed from the social viewpoint as well as in relation to the situations before and after the passing of the Basic Public Nuisance Control Law and the existing state of contamination and the new understanding of health. The change of energy source from coal to petroleum since 1955 produced new types of industrial pollution, and the high rate of economic growth also produced the urban pollutions. Contamination of Yokkaichi was the start of the present pollution problems, and it was followed by the investigations and the passing of several control laws. Enforcemen regulations were completed and the emission limitations were strengthened. Local governments also established regulations. The establishment of the environmental standards was enabled by the Basic Law, and later the standard for sulfur oxides was passed. General noise and carbon monoxide pollutions are now being discusse as to their environmental standards, and standards for special type of noise, fine particles, hydrocarbons, oxidants, nitrogen oxides and exceptionally harmful substances are expected to be established The Public Nuisance Control Plans are also under way together with the provisions for relief measures for pollution victims. Results of investigation of air pollution in 1968 are presented. Water pollution is also described in terms of methyl mercury and cadmium diseases.

23608

Public Nuisance Control Committee (Japan)

BASIC POLICY REGARDING THE ESTABLISHMENT OF PUBLIC NUISANCE CONTROL PROGRAM FOR THE OSAKA AREA. (Osaka chiiki ni kakawaru kogaiboshikeikaku sakutei no kihon hoshin. An). Text in Japanese. Yosui to Haisui (J. Water Waste), 12(9):759-767, Sept. 1, 1970.

A control program is presented which is to be effective throughout Osaka Prefecture which has long been developing as a large industrial area; the enormous economic activity has added much to the pollution problem. Air pollution is severe in the central and Hanshin coastal industrial district, and water pollution is significant in Yodo, Kanzaki, Neya and Yamato Rivers. Water quality in Osaka Bay has deteriorated to the extent of ruining the fishing industry. The ground settling problem in East-Osaka, and the noise from Osaka International Airport have invited many complaints. The pollution levels are to be lowered to within the tabulated limits by 1980. There are many necessary control measures, but the following are especially emphasized in view of the national planning priorities. They are the control measures against stationary air pollution sources, purification of coastal waters and rivers and streams, control of nuisances accompanying automobile traffic, treatment measures for metropolitan and industrial wastes, and the control of airport noises. In addition, surveillance and measurement systems as well as cooperation with th neighboring prefectures are indispensible. Detailed tables are given on the target maximum allowable concentrations of sulfur oxides, suspended particulates, and carbon monoxide in air as well as for cyanides, alkyl mercury, organic phosphorous, cadmium, lead, chromium, arsenic, and mercury in general for water pollution. Values for pH, BOD, SS, DO and coliform bacteria counts are also given. The maximum allowable noise levels for daytime, morning and evening are also listed.

23610

Public Nuisance Control Committee (Japan)

BASIC POLICY REGARDING THE ESTABLISHMENT OF A PUBLIC NUISANCE CONTROL PROGRAM FOR THE TOKYO AREA. (Tokyochiiki ni kakawaru kogaiboshikeikaku sakutei no kihonhoshin. An). Text in Japanese. Yosui to Haisui (J. Water Waste), 12(9):750-758, Sept. 1, 1970.

A control program to be effective throughout the Tokyo metropolitan area other than islands in the Pacific Ocean

under the jurisdiction of the metropolitan government is presented. The area is a megalopolis with 11.5 million people, and the industrial and economic activities are increasingly exacerbating the pollution problem. Air pollution from automobiles and factories is severe. It originates from the central and Joto areas as well as from factories along the Arakawa River and Sumida River. Water pollutio in Sumida, Naka, and Tama Rivers is also intense. The pollution levels are to be lowered to within the tabulated limits by 1980. The necessary control measures are numerous, but the following are especially emphasized in view of the national planning priorities. They are the control measures against stationary air pollution sources, purification of sea water in the coastal areas and fresh water in rivers and streams, control of nuisances accompanying automobile traffic, control of ground settling (in some areas as deep as four meters), and treatment measures for metropolitan and industrial wastes. In addition, the establishment of nuisance monitoring and measurement system is necessary, and close cooperation with the neighboring prefectures is indispensable. Detailed tables are given on the target maximum allowable concentrations of sulfur oxides, suspended particulates, and carbon monoxide in air as well as cyanides, alkyl mercury, organic phosphorus, cadmium, lead, chromium, arsenic, mercury in general and pH, BOD, SS, DO, and coliform bacteria values for water pollution. The maximum allowable noise levels for daytime, morning and nighttime are also listed.

24214

Public Nuisance Control Committee (Japan)

BASIC POLICY REGARDING THE ESTABLISHMENT OF PUBLIC NUISANCE CONTROL PROGRAM FOR THE KANAGAWA AREA. (Kanagawa chiiki ni kakawaru koga boshikeikaku sakutei no kihon hoshin. An). Text in Japanese. Yosui to Haisui (J. Water Waste), 12(9):768-776, Sept. 1, 1970.

A control program to be effective in the area East of Sagami River within Kanagawa Prefecture is presented. This area serves as the mainstay of the Japanese economy, industries such as electric power, steel, petroleum, chemicals and heavy automobile traffic have contributed to the chronic pollution problems. Air pollution in the Taishi and Tajima areas and water pollution in Tama, Tsurumi, and Katabira Rivers as well as Tokyo Bay are extremely severe. The pollutant levels are to be lowered to within the tabulated limits by 1980. There are many necessary control measures, but the following are especially emphasized in view of the national planning priorities. They are the control measures against stationary air pollution sources in Kawasaki, especially purification of coastal waters and rivers and streams, control of nuisances accompanying automobile traffic, and treatment measures for metropolitan and industrial wastes. In addition, surveillance and measurement systems as well as cooperation with the neighboring prefectures are indispensable. Detailed tables are given on the target maximum allowable concentrations of sulfur oxides, suspended particulates, and carbon monoxide in air as well as cyanides, alkyl mercury, organic phosphorus, cadmium, lead, chromium, arsenic, mercury in general, and pH, BOD, SS, DO and coliform bacteria values for water pollution. The maximum allowable noise levels for daytime, morning and evening are also listed.

25288

Middleton, John T.

AIR POLLUTION CONTROL: SOME LESSONS LEARNED IN THE UNITED STATES. Preprint, National Academy of Medicine, Mexico City (Mexicc), 13p., 1970. (Presented at the Conference on Air Pollution, Mexico City, Feb. 18, 1970.)

In the United States the fundamental philosophy that has evolved in the development of air pollution control programs is that air pollution control begins at the source. One of the approaches that has been developed to carry out this philosophy is the permit system, which requires that anyone who wishes to construct or operate a machine, equipment or other contrivance which may pollute the air obtain the prior permission of a government agency. Standards have been set limiting the emissions from automobiles. The kind and degree of control of stationary sources will vary from area to area depending upon such diverse parameters as climate and weather, degree of industrialization, population density, and topography. It is here that the technique of diffusion modeling plays an important role. Losses to agriculture alone were recently estimated to exceed $325 million annually in the United States, while studies show that an exposure to 12 mg/cu m (10 ppm) carbon monoxide for approximately eight hours may increase the blood carboxyhemoglobin level to produce some decrement in mental performance. A British study found an association between air pollution and deaths from bronchitis and lung cancer in an area where the yearly average sulfur dioxide level was 116 micrograms/cu m (0.04 ppm). Another study found an association between particulate matter and prostatic cancer, while eye irritation has been demonstrated when oxidant levels increase above 100 micrograms/cu m. Hydrocarbons, nitrogen oxides, lead and mercury compounds are also mentioned. Government responsibility on federal state, and local levels is also discussed.

29230

Japan Public Health Assoc.

STUDIES ON THE RANGE OF DISEASES DUE TO EFFECTS OF POLLUTIONS. (Kogai no eikyo ni yoru shippei no hani to ni kansuru kenkyu). Text in Japanese. 42p., March 1970. 18 refs.

In 1969, the ministry of health and welfare established a committee to examine the designation of diseases due to pollution. Committee members were divided into groups to tackle diseases peculiar to particular regions. A subcommittee was organized on Minamata Disease, since it was prevalent at two different localities in two different periods. The second general meeting was held in December 1969, establish a law concerning special measures to relieve the health damages due to pollution. Discussion was held based on the reports from various groups and a report was made incorporating necessary ordinances and public notices in accordance with the law. The committee members believed that bronchial asthma, chronic bronchitis, asthmatic bronchitis and emphysema should be designated, although they are non-specific diseases, as different from specific diseases like Minamata Disease and Itai-itai disease, which are brought about by polluted water. Overall judgment would have to be made based on the history of residence and disease, since it is difficult to clinically distinguish diseases due to air pollution and those which are not. Other diseases may occur after the primary disease. The diagnosis of chronic asthma should be in accordance with the definition of the American Thoracic Society, and emphysema should agree with the Emphysema Study Association Diagnosis standards. The minimum items to be checked are: lung capacity one second volume, tracheal resistance, residual volume (if necessary), chest x-ray, heart function (if necessary), blood pressure, electrocardiogram, blood test (red and white corpuscles and hemoglobin), phlegm (shape, volume, and microbes), skin reactio to allergy, and house dust. The report also contains a section on organic mercury and cadmium. It is recommended that further studies of the effects of pollution be made and that notes be compared by those concerned in different areas. Extracts of the laws related to pollution

M. SOCIAL ASPECTS

23145

Hashimoto, Michio

A NEW POLITICAL APPROACH TO CONTROL PUBLIC NUISANCE. (Kogai - gyosei no tachiba kara). Text in Japanese. Toho Igakkaishi (J. Med. Soc. Toho, Japan), 16(6):608-614, Dec. 1969.

The general discussion of public nuisance control is geared towards the implications of control laws and governmental involvement and responsibilities. The legal control of pollution problems must be performed systematically, since it concerns many ministries and agencies. Detailed explanations concerning how the sulfur dioxides environmental standard was established are given. The threshold value is explained as is the academic definition of 'purity', and the environmental standard is designed toward the administrative aim of maintaining the threshold at a feasible level. The standard was declared to be impossible by the industrial and the business sector of the economy, but the ten-year plan attached to the standard was patterned after the plan of the Ministry of International Trade and Industry. Studying the relationship between pollution and public nuisance was difficult, and the opposition of the industries was based on the absence of firm evidences. This is the crux of future pollution control. In view of the present and past examples, the possibility of administration without complete scientific investigation is the key to pollution control. The difficulty of investigating public nuisance problems such as the methyl mercury poisoning in Minamata as well as the problems encountered in the course of the interaction of administrative-political and academic-medical decision-making are explained.

AUTHOR INDEX

A

ABERNETHY, R F *A-06351
ADAMO M *G-34682
ADAMSON, D L *C-06045
AGUILLARDO D F-13197
AIDAROV, T K C-07567
ALTERMAN, N A *G-08387
ALTMAN, P L *F-09764
ANBAR M *G-13446
ARMSTRONG D W B-28918, *G-28013
ARUIN, A S *C-08134
ASO K G-30308
ASPERGER S *C-33277
AUGHEY H *C-25431

B

BARNES E C *C-34815
BARRINGER, A R *C-05191
BARRY G D-31112
BATTIGELLI M C *G-33504
BEDERKA J P JR *G-31705
BELILES, R P *G-08092
BELLUSCIO, P R G-08092
BERG H *H-25826
BERLIN M *G-18036
BERLIN, M H *G-12653
BERMAN E *C-33338
BITTERSOHL G *G-34621
BOATMAN J B A-12422, L-12423
BOLKER H I *A-31548
BOUSSINGAULT M *H-22952
BRAR S S *D-20790
BREWER, L W *C-09333
BRINK J A JR C-23771
BROWETT, E V *C-05977
BROWN, J R *G-08746
BRUNE D *C-11626, *G-31624
BRUSKIN, Z Z *D-06671
BUTRICO F A A-12422, L-12423
BYRNE A R *H-29147, *H-33046

C

CHATIGNY M A *C-26275
CHAUDET, J H C-09751
CHOLAK, J *D-04986
CHRISTIAN C M II *C-34432
CHRISTIE, A A *C-07772
CLARK, R S G-08092
CLARKSON, T *G-06172
CLARKSON, T W *G-11556
COPPLESTONE, J F *G-07319
CORN M D-31112
CRAIG J C C-26275
CROCKER W *H-23696, H-28849
CROSS C E G-31224
CUCUEL F A-34754
CULP D A C-29652

D

DABROWSKI, Z G-09397
DAINES R H H-21691
DALLAVALLE J M B-28918
DARBY R L A-12422, L-12423
DAVIS W H *G-27801
DE SCHMERTZING, H *C-09751
DELAUGHTER B *C-27389
DERMELJ M H-33046
DIEMAN *H-19770
DITTMER, D S F-09764
DUBROVSKAYA D P A-14286
DUFF, G M C-09369
DUNSDON, A J C-07772

E

EDA S *A-29787
EDINGER J G C-26275
EDWARDS T I B-28918
EJIRI S A-29787
ELKINS, H B *G-06680
EPSTEIN S S *G-26740
ESHLEMAN A *A-33641
EYBL V *G-31629

F

FAIRHALL L T *G-32608
FAZACKERLEY J G-18036
FICKLIN W H A-27081
FITE L E C-33042
FLEWELLING F J *B-30117
FLINN R H B-28918
FORESTER G C-26275
FUJINAGA T *C-32534
FUJINO T G-30308
FUJIWARA T *C-32718
FUKUDA K *G-32546
FUKUI S *C-28126, *C-32476
FULKERSON W A-34827

G

GAYNULLINA E T *C-34939
GIBSON, F H A-06351
GILL J E C-26275
GIMADEEV, M M *G-09524
GIRINA V V C-28450
GLEBOVA L F K-28466
GLUSKOTER H J A-30457
GOEIJ J J M D *A-30292
GOLDBERG E D A-34424
GOLDMAN F H B-28918, *G-28030
GOLDWATER L J *G-32936
GOULDING R *G-31543
GRANT N *A-29643
GRAY A S B-28918
GROSS S B A-12422, L-12423
GUSTAFSON P F D-20790

H

HABCZYNSKA, D G-07234
HAGINO N G-30308
HAINES G F JR C-28214
HAJDUK J *H-25927
HALLEE T J *G-18128
HASHIMOTO M *L-23116, *M-23145
HATTORI D M D-20790
HECK W W *H-21691
HEIMANN, H *G-07423
HEMEON W C L *C-28214
HENDERSON R C-29652
HENDRICKS R H H-17710
HIKICHI H A-29787
HINDAWI I J H-21691
HIRAYAMA T C-29770
HOUGH J W B-28918
HOUTMAN J P W A-30292
HWANG J Y C-31862

I

IIJIMA N G-19190
IKI S *D-27188
INBAR M G-13446
ISHIBASHI U G-30308
ITO H A-29787

J

JACOBS M B C-28583
JENNE E A *E-26697
JOENSUU O I *A-30017
JOHNELS A G *H-34881
JONES J D *C-31171
JORDI A *G-27085
JUNG F *G-32218

K

KAISER G *C-28354
KANABROCKI E L D-20790
KANBARA S *B-29450
KANEBO M *C-19506
KANGAS B-29328
KANGAS J *B-32461
KANNO S *C-30635
KARIMOVA L K *G-29255
KAZANTZIS, G *G-06176
KEENAN, R G *G-08079
KENNEDY E J A-30457
KHRUSTALEVA, V A *C-07284
KHUKHRIN, E V *K-06677
KIDA F G-30308
KING E *D-29545
KIRYAKOV, K *G-05185
KLEINFELD M *F-13197
KLINE J R D-20790
KOIDE M A-34424
KORSHUN, M N *A-08489
KOSMIDER, S *F-11570, *G-07234, *G-09396, *G-09397
KOSTA L H-29147, H-33046
KOYAMA M C-32534
KRAUSE L A *C-29652
KRIVAN V *C-28338
KRUGER P F-32072
KRUPITSKAYA, I D *B-06884
KUDSK F N *G-06239, *G-18247
KUDSK, F N *G-13035

KULKARNI, M V G-08746
KUPEL R E C-34808
KURNOSOV V N *K-21133
KURNOSOV, V M *G-05945
KURODA D *C-29480
KUYKENDALL W E C-33042

L

LAKTIONOVA T YE C-28450
LARSSON L *C-30199
LEACH S J *F-13348
LEACH, L J G-08092
LEARNED R E A-27081
LEBEDEV YU D *K-28466
LEE, D *B-06837
LEFFERTS, D T C-09587
LIDEN K C-11626
LINCH, A L *C-09587
LINDBERG W *G-13625
LOB, M *G-07337
LOVE G J *K-34100
LUCHINA, K I A-06909
LUTZ C A *A-12422
LUTZ G A *L-12423
LYON W S A-34827

M

MACLEOD W D C-26275
MALENFANT A L *C-31862
MANINGER R C C-26275
MARK H B C-31171
MARSHALL, B S C-07772
MASTROMATTEO, E *G-05737
MATSAK, V G *F-06648
MATSUMOTO M D-27188
MATSUZAKI J C-19506
MATTSSON S C-11626
MAYZ E *D-31112
MCARTHUR, D A G-07319
MCCARTHY J H JR *A-27081
MCGEE L C *G-27317
MELEKHINA V P *A-17624
MERTYL V G-31629
MESMAN B B *G-27387
MEUSCHKE J L A-27081
MIDDLETON J T *L-25288
MIRARCHI, A O G-11241
MOFFITT A E JR *C-34808
MOLOKHIA, M M *G-08328
MOORE, P J A-12422, L-12423
MOORE, C E D-20790
MORGAN G B *A-23561
MURATI I C-33277
MUSTAFA M G *G-31224

N

NAGAYAMA S A-29787
NAITO S C-19506
NEAL P A *B-28918, *G-34756
NEDOGIBCHENKO M K K-28466
NELSON D M D-20790
NELSON G O *F-14712
NEVILLE G A *G-21113
NISHIMURA K *C-29770
NISHIMURA T D-27188
NISHIYAMA K A-29787
NORDBERG G G-18036
NORDBERG, G *G-09406
NORDBERG, G F G-12653
NURMUKHAMETOV R N C-34939
NYHOLM E B-29328, B-32461

O

OHTA, Y *G-05470
OKASHITA H C-32718
OZOLINS G A-23561

P

PAKTER M K *A-14286
PARAMESHVARA, V *G-07330
PATRIARCHE G J C-31171
PATTON W F *C-23771
PAULSEN K E C-31171
PERSHIN A V A-14286
PETROVA, N I *B-06883
PISAREVSKII, I L B-06884
POKROVENKO, Z I B-06883
POLOZHAYEV N G *C-28450
PORTER D H *B-34795
POSTMAN B F B-28918

Q

QUINO E A *C-33278

R

RANCITELLI L A *A-33004
RASTAS J *B-29328, B-32461
RAZUMOV, V A *C-07567
REINHAUT W H B-28918
REPORT OF A SURVEY ON ENV *D-31371
REUTOV, O A *F-10866
RICHTER O *H-24773
ROBINSON J W C-34432
ROESMER J *F-32072
ROGOWSKA, E G-09396
ROTH, E M *G-11241
ROTTSCHAFER J M C-31171
ROZENBERG J *F-15266
RUCH R R *A-30457
RUHLING AKE *H-23436
RUZICKA M H-25927
RYAZANOV, V A *K-05940

S

SASA T *G-30308
SAVITSKII, I V G-10361
SAYERS R R *G-28846
SCHNECK T JR C-26275
SERENIUS, F G-09406, G-12653
SETSUDA S C-19506
SHAKHBAZYAN, G K *K-07576
SHALYA, N G C-07284
SHIRAKAWA K *G-17470
SHIKASAWA T *C-29343
SHOTWELL H P C-29652
SHTERENGARTS, R Y G-10361
SHULTS W D A-34827
SIEGEL B Z A-33641
SIEGEL S M A-33641
SMITH B S G-27387
SMITH S B C-31862
SMITH, H G-08328
SOKOLOVSKIY, V V *G-06617,
SONODA K G-19190
SOROKINA, S F G-08387
STAHL Q R *A-21751
STALZER, R F C-09587
STEIN E F-13197
STEPANOV A S B-31390
STEPHENS E R C-26275
STEPHENS, J D C-06045
STITT F *C-33886
STOCK A *A-34754, *G-29276
SYKORA J G-31629

T

TADA O *G-13154
TAKEUCHI J G-30308
TALALAEV G K A-14286
TEJNING S *G-33868
THILLIEZ, G *C-10392, *D-07649
THOMAS M D *H-17710
THOMPSON J E *D-30511
TOELG G C-28354
TOKUOMI H G-30308
TOMIMATSU Y C-33886
TOYAMA T G-30308
TRAKHTENBERG, I M *A-06909, *G-08167, *G-10361, K-07576
TSCHOEPEL P C-28354
TSUBAKI T G-30308
TSUCHIYA K *G-23012
TSUKIYAMA H C-32718
TUDDENHAM, W M C-06045
TYLER W S G-31224

U

UEDA K *C-15451
UI J *G-19190
ULFVARSON, U *G-09056
ULLMANN W W *A-31313
ULRICH W F *C-34388
UTAGAWA T *H-27872

V

VALIC F *C-28583
VEAZIE W H A-12422, L-12423

W

WAINERDI R E *C-33042
WALLACE R A *A-34827
WATTS J D B-34795
WAZNA BOGUNSKA, C G-07234
WEISS H V *A-34424
WEISSLER A *C-30510
WEST J M *A-33058
WHEELER F *E-23809
WHITEMAN J L *F-22567
WILLISTON, S H *D-12065
WILSON, H N *C-09369
WITSCHI H *G-34789
WOLOCHOW H W C-26275

Y

YAN TSEI, U F-10866
YOSHINAGA S D-27188
YUILE, C L G-08092

Z

ZAJACZKOWSKI, S G-09396
ZEMSKOV I F *B-31390

SUBJECT INDEX

A

ABATEMENT A-21751, K-28466, K-34100, L-23116, L-23608, L-23610, L-24214, L-25288
ABSORPTION A-29643, B-06883, C-05977, C-09587, C-29770, C-30199, C-30635, C-31862, E-26697, G-06680, G-08328, G-09056, G-18247, H-24773
ABSORPTION (GENERAL) B-06883
ACETALDEHYDE G-11241
ACETIC ACID D-31371, F-06648, G-06617, G-08079, G-11241, H-25826
ACETONE C-09333, C-09751, F-06648, F-09764, G-11241, G-27317, K-05940
ACETYLENES C-09751, C-34939, F-09764, G-11241, H-21691, H-24773
ACIDS A-23561, B-29328, B-29450, B-32461, C-09333, C-09369, C-09587, C-23771, C-28126, C-30199, C-32476, C-34432, D-31371, F-06648, F-09764, G-06617, G-06680, G-08079, G-11241, H-17710, H-20158, H-21691, H-23696, H-25826, K-05940, K-06677, K-28466, K-34100
ACROLEIN C-09369, G-11241
ACUTE C-15451, G-08167, G-32608, K-05940
ADAPTATION G-09524, H-33046, K-07576
ADMINISTRATION A-31313, B-34795, C-29343, D-29490, D-31571, E-23809, E-28465, H-25927, K-28466, L-12423, L-23608, L-23610, L-24214, L-25288, L-29230, M-23145
ADSORPTION B-06837, B-06883, B-31390, F-22567
ADULTS A-31313, F-11570, G-08328, G-08387, G-18128, G-23012
AEROSOLS B-06884, C-33042, D-30511, D-31112, F-09764, G-08328, G-09396, G-11241, K-05940, K-06677
AGE F-11570, G-33868, G-34756
AIR POLLUTION EPISODES G-07423, G-33868
AIR POLLUTION FORECASTING D-32912
AIR QUALITY CRITERIA A-34827, K-34100
AIR QUALITY MEASUREMENT PROGRAMS A-31313, D-29490, D-31371, L-12423, L-23608, L-23610, L-24214
AIR QUALITY MEASUREMENTS A-06351, A-08489, A-17624, A-21751, A-33641, C-05977, C-07284, C-07567, C-10392, C-28583, C-29343, D-04986, D-06671, D-12065, D-20790, D-26557, D-27188, D-29490, D-29545, D-30511, D-31112, D-31371, D-32912, G-05945, G-06239, G-07319, G-07337, H-20158, H-23436, H-29147, K-05940
AIR QUALITY STANDARDS A-08489, A-29643, C-34815, D-30511, G-05945, G-06680, G-07337, G-11241, G-31280, K-05940, K-06677, K-21133, K-28466, K-34100, K-34664, L-23608, L-23610, L-24214
AIRCRAFT C-05191, E-23744, E-28465
AIRPORTS L-23608
ALCOHOLS C-09333, C-09369, C-09751, C-34388, D-31371, F-06648, F-09764, G-05737, G-06680, G-08079, G-11241, G-13035, K-28466
ALDEHYDES A-23561, B-06837, C-09333, C-09369, C-26275, C-32476, C-32534, C-34939, D-04986, D-31371, F-09764, G-08079, G-11241, K-05940, K-06677
ALFALFA H-17710, H-20158
ALIPHATIC HYDROCARBONS C-09369, C-09751, C-34939, F-06648, F-09764, G-06680, G-11241, H-17710, H-20158, H-21691, H-23696, H-24773, H-25826
ALLERGIES C-15451, L-29230
ALTITUDE A-27081, A-34424, D-12065, E-23744, F-23809, F-09764
ALUMINUM G-11241, K-06677
ALUMINUM COMPOUNDS D-04986, D-20790, F-22567, G-11241
ALUMINUM OXIDES K-06677
ALUMINUM SILICATES F-22567
ALVEOLI G-09406, G-12653, G-31224
AMIDES G-11241
AMINES B-06837, C-34939, F-06648, F-09764, G-05737, G-11241, G-27317
AMINO ACIDS G-09524
AMMONIA B-06837, C-09369, C-09751, C-28126, C-32534, D-04986, F-06648, F-09764, G-11241, G-28846, H-17710, H-20158, H-21691, H-23696
AMMONIUM CHLORIDE C-23771
AMMONIUM COMPOUNDS B-06837, B-29450, C-09369, C-09751, C-23771, C-28126, C-32534, D-04986, F-06648, F-09764, G-11241, G-28846, H-17710, H-20158, H-21691, H-23696
ANALYTICAL METHODS A-21751, A-30017, A-30292, A-30457, A-33004, A-33058, A-33641, A-34424, A-34754, A-34827, B-28918, C-05191, C-05977, C-06045, C-07284, C-07567, C-07772, C-08134, C-09333, C-09369, C-09587, C-09751, C-10392, C-11626, C-19506, C-20944, C-26275, C-27389, C-28126, C-28338, C-28354, C-28450, C-28505, C-28583, C-29480, C-29770, C-30199, C-30510, C-30635, C-31171, C-31862, C-32476, C-32534, C-33042, C-33277, C-33278, C-33338, C-33886, C-34388, C-34808, C-34815, C-34939, D-07649, D-20790, D-31371, D-32912, F-13348, F-15266, F-32072, G-05470, G-06239, G-06617, G-08079, G-08328, G-09056, G-13035, G-27387, G-28013, G-28030, G-31624, H-33046, H-34881
ANEMIA A-31313
ANIMALS A-21751, A-34827, C-31171, C-31862, C-33042, E-23744, F-09764, F-11570, F-13197, G-05945, G-06617, G-07234, G-08092, G-08167, G-08746, G-09396, G-09397, G-09406, G-09524, G-10361, G-11556, G-12653, G-13446, G-18036, G-21113, G-27801, G-31543, G-31629, G-31705, G-32546, G-32936, G-33868, G-34682, H-23696, H-27872, H-33046, H-34881, K-05940, K-21133
ANNUAL A-33004, D-29490
ANOXIA G-08167
ANTHRACENES F-06648
ANTIDOTES G-29255
ANTIMONY COMPOUNDS A-06351, A-33004, C-06045, D-04986, D-20790, F-06648, F-09764, G-06680, G-08328, G-11241
AREA SURVEYS D-29490, D-31371
AROMATIC HYDROCARBONS C-09333, C-09751, C-32534, C-34939, F-06648, F-09764, G-05737, G-06680, G-08079, G-08746, G-11241, G-27317, G-28846, K-05940, K-06677
ARSENIC COMPOUNDS A-33004, C-09333, C-25431, C-30635, C-32718, C-33338, D-04986, D-27188, F-06648, F-09764, G-06680, G-07423, G-08079, G-08328, G-17470, G-28846, G-31280, G-31543, G-32608, H-23436, K-06677, K-28466, L-23608, L-23610, L-24214
ARSINE F-09764, G-06680, G-08079, G-28846
ASBESTOS A-23561, G-05737, G-06680, G-07423, G-13625, G-27085, K-06677, K-34100, K-34664
ASBESTOSIS G-13625, G-27085
ASHES A-33004, D-27188
ASIA A-29787, B-29450, C-15451, C-19506, C-28126, C-28505, C-29343, C-29480, C-29770, C-30635, C-32476, C-32534, C-32718, D-26557, D-27188, D-31371, D-32912, G-05470, G-07423, G-13154, G-17470, G-19190, G-23012, G-30308, G-31705, G-32546, G-33868, H-27872, L-23116, L-23608, L-23610, L-24214, L-29230, M-23145
ASPHALT G-13625, H-25826
ASPHYXIATION G-11241
ASPIRATORS C-08134
ASTHMA G-07423, G-13625, G-30308, L-29230
ATMOSPHERIC MOVEMENTS A-29787, A-30292, D-06671, D-12065, D-31371, D-32912, K-34664
ATTACK RATES G-08387, G-27085
AUSTRALIA F-13348
AUTOMATIC METHODS C-28214
AUTOMOBILES A-23561, A-31313, D-26557, D-27188, D-32912, K-34100, L-23608, L-23610, L-24214, L-25288
AUTOMOTIVE EMISSIONS A-23561, C-09369, C-26275, D-26557, D-27188, D-32912, E-26697, L-23608, L-23610, L-24214, L-25288
AUTOPSY F-11570, G-05945, G-08079
AZOLES C-34939

B

BACTERIA C-34388, F-09764, G-11241
BARIUM COMPOUNDS A-06351, C-25431, C-32718, E-26697, G-17470
BARLEY H-17710
BATTERY MANUFACTURING B-34795, C-07284
BELGIUM G-07423
BENZENES C-09333, C-09751, F-06648, F-09764, G-06680, G-08079, G-11241, G-28846
BERYLLIOSIS G-13625
BERYLLIUM G-06680, G-07423, G-08079, G-11241, G-13446, K-06677
BERYLLIUM COMPOUNDS A-06351, C-09333, C-28354, C-34939, D-04986, D-27188, F-09764, G-06680, G-08079, G-11241, G-13625, G-27085, G-31705, G-32608, K-06677, K-34100, K-34664
BETA PARTICLES C-09333, C-11626
BIO-ASSAY C-33042, G-08079, H-33046
BIOCLIMATOLOGY G-34682
BIOMEDICAL TECHNIQUES AND MEASUREMENT C-05977, C-09333, C-10392, D-06671, F-09764, F-11570, G-05185, G-05470, G-05737, G-05945, G-06172, G-06176, G-06680, G-07234, G-07319, G-07330, G-07337, G-08079, G-08092, G-08167, G-08328, G-08387, G-08746, G-09056, G-09396, G-09397, G-09406, G-09524, G-10361, G-11241, K-05940, K-06677, K-07576
BIOPSY G-08328, G-18128
BIRDS G-08092, G-33868, H-27872, H-34881
BISMUTH C-06045
BISMUTH COMPOUNDS A-06351
BLOOD CELLS F-09764, G-08746, G-09056, G-09397, G-11556, G-12653, G-13035, G-18036, G-27085, G-32218, G-33504, G-34789
BLOOD CHEMISTRY A-31313, C-05977, C-10392, C-31171, G-06172, G-07234, G-08079, G-08746, G-09056, G-09396, G-09397, G-09524, G-10361, G-13035, G-18247, G-31624, G-32218, G-34621, H-33046, K-07576
BLOOD VESSELS F-11570, G-07234
BODY CONSTITUENTS AND PARTS F-09764, F-11570, G-05185, G-05945, G-06172, G-06176, G-06617, G-06680, G-07234, G-07319, G-07330, G-07337, G-08092, G-08167, G-08328, G-08746, G-09056, G-09396, G-09397, G-09406, G-09524, G-10361, G-11241, G-11556, G-12653, G-13446, K-07576
BODY FLUIDS G-06680, G-07330, G-10361, G-11556, G-13035, G-34621, G-34789
BODY PROCESSES AND FUNCTIONS B-06884, F-09764, G-05185, G-05737, G-05945, G-06172, G-06617, G-06680, G-07234, G-07319, G-07330, G-07337, G-08079, G-08092, G-08167, G-08328, G-08746, G-09396, G-09397, G-09406, G-09524, G-10361, G-11241, G-11556, G-12653, K-05940, K-06677, K-07576
BOILERS D-32912, L-23610
BORON COMPOUNDS A-06351, C-09369
BREATHING C-09333, G-12653, G-13625, G-34621, G-34682
BREATHING APPARATUS D-06671
BREATHING EXERCISES K-05940
BROMIDES C-32718, F-06648, G-34621
BROMINATED HYDROCARBONS F-06648
BROMINE D-20790, H-25826
BROMINE COMPOUNDS C-32718, C-33042, C-33277, C-33278, F-06648, F-09764, G-28846, G-34621, H-25826
BRONCHI G-09406
BRONCHITIS G-07423, G-08387, G-13625, G-30308, L-25288, L-29230
BRONCHOCONSTRICTION G-07423
BRONCHOPNEUMONIA F-09764, G-08387
BUILDINGS A-06909, A-08489, B-06884, C-27389, K-06677
BUTADIENES F-06648
BUTANES C-09369, G-11241
BUTYNES F-09764, G-11241
BUTYRALDEHYDES F-09764, G-11241
BY-PRODUCT RECOVERY A-31548, A-34827, B-29328, B-29450, B-32461
BYSSINOSIS G-27085

C

CADMIUM C-06045, F-06648, G-06680, G-07319, G-08079, G-08328, G-11241, G-13446, K-06677, K-07576
CADMIUM COMPOUNDS A-29787, C-09333, C-28126, C-28505, C-29343, C-30635, C-32476, C-33338, C-34432, C-34641, D-04986, D-26557, D-27188, F-09764, F-13197, G-06680, G-08079, G-11241, G-17470, G-30308, G-31224, G-31280, G-31705, G-32608, K-06677, K-07576, L-23116, L-23608, L-23610, L-24214, L-29230
CALCIUM COMPOUNDS C-05977, D-04986, E-26697, F-22567, G-06680
CALIBRATION METHODS C-09587, C-30635, C-33886, C-34432, C-34641, D-07649, G-09056
CALIFORNIA D-12065
CANADA A-06351, A-31548, B-30117, G-05737, G-08746, G-21113
CANCER F-09764, G-07423, G-08328, G-13625, G-26740, L-25288
CARBON BLACK B-31390, F-09764, G-06680
CARBON DIOXIDE C-09369, C-09751, C-32534, D-04986, D-32912, E-23744, E-23809, E-28465, G-08079, G-11241
CARBON DISULFIDE F-06648, G-08079, K-05940, K-28466
CARBON MONOXIDE A-23561, C-09369, C-09751, C-32534, D-04986, D-32912, F-09764, G-07423, G-08079, G-11241, G-13154, G-13625, G-27085, G-27801, G-31705, G-34621, G-34682, H-20158, H-21691, H-24773, H-25826, K-05940, K-28466, K-34100, L-23116, L-23608, L-23610, L-24214, L-25288
CARBON TETRACHLORIDE F-06648, G-11241
CARBONYLS C-09369, F-09764
CARBOXYHEMOGLOBIN G-11241, G-13154, L-25288
CARCINOGENS C-34939, G-26740
CARDIOVASCULAR DISEASES F-11570, G-13625, K-07576
CASCADE SAMPLERS C-23771
CATALYSIS B-06837, B-29450, C-33277
CATALYSTS B-29450
CATALYTIC ACTIVITY C-33277
CATTLE G-32936, H-33046
CELL METABOLISM G-31224, G-34789
CELLS A-29643, F-09764, G-06617, G-08746, G-09056, G-09397, G-11556, G-12653, G-13035, G-18036, G-27085, G-31224, G-32218, G-32936, G-33504, G-34789
CEMENTS A-34424, G-06680, K-06677, K-34100
CENTRIFUGAL SEPARATORS B-29328, B-32461, C-23771
CERAMICS G-08079
CERIUM COMPOUNDS D-20790
CESIUM COMPOUNDS C-09333, D-20790

CHARCOAL B-06837, C-05977, C-34808, G-08079, H-24773
CHEMICAL BONDS F-32072, G-32936, G-34789
CHEMICAL COMPOSITION A-06351, A-17624, C-05977, C-10392, D-12065, D-20790
CHEMICAL METHODS A-34754, C-05977, C-07284, C-09333, C-10392, C-26275, C-30199, C-30635, C-32476, C-32534, F-13348, F-32072, G-28030, G-31624
CHEMICAL PROCESSING A-12422, A-14286, A-31548, A-34424, A-34827, B-29450, B-30117, B-32461, B-34795, C-23771, D-31371, G-05185, G-05737, G-10361, G-27317, G-33868, K-05940, K-34100, L-24214
CHEMICAL REACTIONS A-23561, B-06837, B-29328, B-29450, C-28354, C-29652, C-31862, E-26697, F-10866, F-15266, F-32072, G-08746, G-09056, G-11241, G-11556, G-18247, G-31629, K-34100
CHEMISTS G-08079
CHICAGO D-20790
CHILDREN A-06909, A-31313, D-32912, G-18128
CHLORIDES B-32461, C-09333, C-09369, C-09587, C-09751, D-04986, D-06671, F-06648, G-06617, G-08167, G-11241, G-29255, G-32218, H-23696, H-28849, K-06677
CHLORINATED HYDROCARBONS C-09751, C-29480, C-34388, C-34432, C-34939, E-23809, F-06648, F-09764, G-06680, G-08079, G-11241, G-13154, G-31543, G-31705, H-20158, H-27872, K-06677
CHLORINE A-06351, B-06883, B-30117, B-31390, B-34795, C-09369, C-26275, C-28126, C-28450, D-20790, D-31371, D-32912, F-09764, F-15266, G-11241, H-17710, H-21691, H-23696, K-05940, K-28466
CHLORINE COMPOUNDS B-32461, C-09333, C-09369, C-09587, C-09751, C-28126, C-31171, C-32476, C-33277, D-04986, D-06671, F-06648, F-09764, G-06617, G-06680, G-08167, G-11241, G-28846, G-29255, G-31543, G-32218, H-20158, H-23696, H-28849, K-05940, K-06677
CHLOROFORM C-09751, F-06648, F-09764, G-11241
CHLOROSIS H-21691
CHROMATES C-09333, G-32608, K-06677
CHROMATOGRAPHY A-30292, C-09333, C-09751, C-26275, C-28126, C-28505, C-30510, C-30635, C-32476, C-32534, C-33886, D-31371, F-32072, G-08079
CHROMIUM G-06680, G-08079, G-11241, K-06677

CHROMIUM COMPOUNDS A-06351, A-33004, C-09333, D-20790, D-27188, F-09764, G-06680, G-08079, G-11241, G-32608, K-06677, L-23608, L-23610, L-24214
CHROMOSOMES A-29643
CHRONIC B-28918, C-15451, F-11570, G-05945, G-06176, G-07330, G-07337, G-07423, G-08167, G-09524, G-10361, G-30308, G-32608, G-34756, K-05940, L-29230
CINCINNATI D-04986
CINDERS A-33004
CIRCULATORY SYSTEM F-11570, F-13197, G-05945, G-07234, G-18036, H-33046
CLAY K-06677
CLOUDS E-23744
COAL A-06351, A-29643, A-30017, A-30457, A-33004, D-26557, D-27188, D-29490, E-23809, F-09764, G-08387, H-17710, K-06677
COAL CHARACTERISTICS A-06351, A-29643, A-30457
COAL TARS H-25826
COBALT COMPOUNDS D-20790, D-27188, F-09764
COKE A-14286
COLLECTORS A-31548, B-29328, B-32461, C-05977, C-23771
COLLOIDS G-31629
COLORIMETRY A-21751, C-05977, C-07284, C-08134, C-09333, C-09587, C-20944, C-28450, C-28583, C-29480, C-32476, C-33278, C-34388, C-34815, C-34939, D-32912, G-06239, G-06617
COMBUSTION A-23561, F-09764
COMBUSTION GASES A-29787, A-30017, B-29328, B-32461, C-29770, D-29490, D-32912, G-08079, G-11241, H-17710, H-33046
COMBUSTION PRODUCTS A-14286, A-23561, A-29787, A-30017, A-33004, B-29328, B-32461, C-29770, D-27188, D-29490, D-32912, G-08079, G-11241, H-17710, H-33046, L-23608, L-23610, L-24214
COMMERCIAL AREAS D-04986, D-27188

COMMON COLD G-07423, G-08387, G-13625
COMPUTER PROGRAMS C-09751, C-34641
CONDENSATION B-06883, C-32718
CONDENSATION (ATMOSPHERIC) E-23744, H-25826
CONNECTICUT A-31313
CONSTRUCTION MATERIALS A-34424, G-06680, G-13625, H-25826, K-06677, K-34100
CONTACT PROCESSING B-32461, K-34100
CONTINUOUS MONITORING A-21751, C-29343, C-32534, D-12065, G-32546, G-32608
CONTROL EQUIPMENT A-21751, A-31548, B-06883, B-06884, B-28918, B-29328, B-30117, B-32461, C-05977, C-07772, C-23771, C-32718, C-34432, D-31112, G-06680, G-07319, G-08079, G-08387, K-06677
CONTROL METHODS A-06909, A-29643, A-31548, A-34827, B-06837, B-06883, B-06884, B-28918, B-29328, B-29450, B-30117, B-31390, B-32461, B-34795, C-05977, C-09587, C-29770, C-30199, C-30635, C-31862, D-29545, D-32912, E-26697, F-22567, G-06680, G-07319, G-07337, G-08079, G-08328, G-08387, G-09056, G-18247, G-34756, H-24773, K-34100
CONTROL PROGRAMS B-34795, D-31371, L-23608, L-23610, L-24214, L-25288, M-23145
CONTROLLED ATMOSPHERES C-05191, C-09751, G-11241, H-24773
COOLING A-23561, B-34795, G-31624
COPPER A-29787, G-08328, G-11241, G-13446
COPPER COMPOUNDS A-06351, A-29787, C-06045, C-28126, C-28505, C-30635, D-04986, D-27188, F-13197, G-11241, G-31224, G-31705, K-06677
CORROSION D-26557
COSTS A-33058, B-34795, H-27872, K-34664
COTTON K-06677
COTTONS K-06677
COUGH F-09764
CRITERIA A-34827, C-30635, G-11241, K-34100
CROP SPRAYING G-27801
CROPS A-29787, C-33042, E-23744, H-17710, H-20158, H-21691, K-06677
CYANATES G-05737
CYANIDES A-29787, C-09369, C-32534, G-06680, G-11241, H-17710, H-25826, L-23608, L-23610, L-24214
CYCLIC ALKANES C-09751
CZECHOSLOVAKIA G-31629, H-25927

D

DATA ANALYSIS D-29545
DATA HANDLING SYSTEMS C-09751, C-33042, C-34641, D-29545, L-12423
DECOMPOSITION B-29328, C-28354, F-10866, F-32072, G-09056
DENSITY A-30457, C-29480, C-32534, G-31624
DEPOSITION A-34424, G-08328, G-09406
DESIGN CRITERIA B-34795, C-11626, C-31862, C-34641, F-14712, L-12423
DESULFURIZATION OF FUELS B-29450

DETERGENT MANUFACTURING C-09751, H-27872
DIAGNOSIS B-28918, C-33042, F-11570, G-05945, G-08079, G-08328, G-13154, G-17470, G-18128, G-28846, G-30308, G-32608, G-34621, H-25826, H-33046, L-29230
DIESEL ENGINES F-09764
DIFFUSION C-26275, D-30511, L-25288
DIFFUSION MODELS D-30511, L-25288
DIGESTIVE SYSTEM G-05945, G-07330, G-08092, G-08746, G-09397, G-18036, G-29255, G-29276, G-33504
DIOLEFINS F-06648
DIPHENYLS F-09764, K-05940
DISPERSION A-23561, A-34424, A-34827, C-26275, C-33042, D-30511, D-32912, E-26697, F-09764, G-32936, K-34664, L-25288
DISPERSIONS F-09764, G-31629
DIURNAL A-27081, D-31371, G-09396, G-09397, G-09524, G-10361, K-28466, K-34664
DOGS F-09764, F-11570, F-13197, G-06617, G-08746
DONORA D-04986, G-07423
DRUGS C-34388, G-07330, G-08746, G-11556, G-27085, G-29255
DUST FALL C-29343, D-26557
DUSTS A-29787, B-06883, B-29328, B-32461, C-05977, C-07772, C-09587, C-23771, C-25431, C-29343, C-32534, C-32718, C-34815, D-04986, D-12065, D-26557, D-29545, D-32912, F-09764, G-06680, G-07319, G-08079, G-08328, G-08387, G-11241, G-28030, K-06677, K-28466, M-23145
DYE MANUFACTURING G-26740

E

ECONOMIC LOSSES H-17710, L-25288
EDUCATION D-31112, E-28465
ELECTRIC POWER PRODUCTION A-33004, A-34827, B-29450, D-29490, D-32912, F-09764, K-34100, L-23610, L-24214
ELECTRICAL MEASUREMENT DEVICES C-10392
ELECTRICAL PROPERTIES B-34795, F-32072
ELECTRICAL RESISTANCE F-32072
ELECTROCHEMICAL METHODS A-34754, C-05977, C-10392, C-26275, C-32534, F-13348, G-28030
ELECTROCONDUCTIVITY ANALYZERS C-32534
ELECTROLYSIS A-08489
ELECTRON MICROSCOPY C-26275
ELECTROSTATIC PRECIPITATORS B-29328, B-32461, C-05977, G-08079
EMISSION STANDARDS B-30117, K-34100, K-34664, L-25288, M-23145
EMPHYSEMA F-09764, G-07423, G-08387, G-13625, G-30308, L-29230
ENFORCEMENT PROCEDURES D-32912

ENGINE EXHAUSTS C-09369, D-26557, D-27188, D-32912, E-26697
ENGINEERS G-08079
ENZYMES C-34388, G-09396, G-09397, G-11241, G-11556, G-21113, G-31224, G-33504
EPIDEMIOLOGY G-23012
EPITHELIUM G-07234
ESTERS C-09333, C-09751, G-11241
ETHERS C-09751, F-06648, G-11241
ETHYL ALCOHOL C-09751, F-06648, F-09764, G-11241
ETHYLENE C-34939, F-06648, F-09764, H-17710, H-20158, H-21691, H-23696, H-24773, H-25826
EUROPE A-06351, A-06909, A-08489, A-14286, A-17624, A-30292, A-34754, B-06883, B-06884, B-29328, B-31390, B-32461, C-07284, C-07567, C-07772, C-08134, C-10392, C-11626, C-20944, C-28338, C-28354, C-28450, C-28583, C-30199, C-30510, C-33277, C-34939, D-06671, D-07649, D-29545, F-06648, F-10866, F-11570, F-15266, F-22567, G-05185, G-05945, G-06239, G-07234, G-07330, G-07337, G-07423, G-08167, G-08328, G-08387, G-09396, G-09397, G-09406, G-09524, G-10361, G-13035, G-13625, G-27085, G-29255, G-29276, G-31543, G-31624, G-31629, G-32218, G-33868, G-34621, G-34682, G-34789, H-19770, H-22952, H-23436, H-24773, H-25826, H-25927, H-29147, H-33046, H-34881, K-05940, K-06677, K-07576, K-21133, K-28466

EVAPORATORS F-09764
EXCRETIONS C-15451, G-06172, G-06176, G-06680, G-07234, G-07319, G-07330, G-09396, G-09397, G-13154, G-29276, H-33046
EXHAUST SYSTEMS B-06883, B-06884, B-28918, G-07319
EXPERIMENTAL EQUIPMENT C-10392, C-11626, C-34641, F-14712, G-09056
EXPERIMENTAL METHODS C-34388, C-34815, D-07649, F-11570, G-07234, G-09056, K-05940
EXPLOSIONS G-27317
EXPOSURE CHAMBERS G-07234, G-08092, G-08167, G-12653
EXPOSURE METHODS F-11570, G-05945, G-06680, G-07234, G-08092, G-18036, G-32546, G-34682, H-28849
EYE IRRITATION F-09764, G-07330, G-07423, L-25288
EYES G-07330

F

FALLOUT C-09333
FARMS G-31543
FEDERAL GOVERNMENTS L-23116, L-29230
FEED LOTS A-34827
FEMALES G-07234, G-08328
FERTILIZING E-23744, F-26697, G-32936, H-34881
FIELD TESTS C-33278
FILTER FABRICS C-07772, C-32718, G-06680, G-08079, K-06677
FILTERS B-06883, B-30117, C-05977, C-07772, C-23771, C-32718, D-31112, G-06680, G-08079, K-06677
FLAME IONIZATION DETECTOR C-09751
FLOW RATES C-09587, C-29480, C-29770, C-31862, G-08167
FLOWERS H-17710, H-21691, H-22952, H-28849
FLOWMETERS G-08079, G-08092
FLUID FLOW C-09587, C-29480, C-29770, C-31862, G-08167
FLUORESCENCE C-32718, C-34388, C-34939, G-07337
FLUORIDES A-2356, B-32461, C-09333, C-32476, D-04986, F-06648, F-09764, G-06680, G-08079, G-11241, G-32608, H-20158
FLUORINATED HYDROCARBONS A-12422, C-09751, F-06648, F-09764, L-12423
FLUORINE A-06351, C-09369, C-11626, G-06680
FLUORINE COMPOUNDS A-23561, B-32461, C-09333, C-09369, C-32476, C-32534, D-04986, D-31371, F-06648, F-09764, G-06680, G-08079, G-11241, G-32608, H-20158, K-06677, K-28466
FOG H-25826
FOOD AND FEED OPERATIONS G-32936
FOODS A-30292, A-31313, A-34754, C-15451, C-30510, D-30511, G-26740, G-31543, G-31705, G-32936, G-33868, H-33046
FORMALDEHYDES A-23561, C-09333, C-09369, C-32476, D-31371, F-09764, G-08079, G-11241, K-05940
FORMIC ACID F-06648, G-11241
FRANCE C-10392, D-07649, F-15266, G-07337, H-19770, H-22952
FREEZING G-31624
FRUITS G-32936, H-21691
FUEL GASES F-09764, H-24773
FUEL OIL PREPARATION B-29450
FUEL OILS B-29450, C-09333, C-32718, C-34939, D-26557, D-27188, E-23809, E-28465, F-09764, L-23608
FUELS A-06351, A-14286, A-29643, A-30017, A-30457, A-33004, A-34424, A-34827, B-29450, C-09333, C-30635, C-32718, C-34939, D-26557, D-27188, D-29490, E-23744, E-23809, E-28465, F-09764, G-08387, G-11241, H-17710, H-24773, K-34881, K-06677, L-23608
FUMES C-05977, C-07772, C-09333, F-09764, G-07234, G-07319, G-07330, G-08079, G-11241
FUNGI F-09764, G-31543
FURNACES B-06883, B-32461, F-09764

G

GAMMA RADIATION G-05470
GAS CHROMATOGRAPHY C-09333, C-09751, C-28126, C-28505, C-30510, C-30635, C-32534, D-31371, G-08079
GAS SAMPLING C-09333, C-09587, C-26275, C-27389, C-32476, C-32718, D-31112, D-32912, G-06239, G-08079
GASES A-33641, B-06837, B-06883, F-09764, G-08079, G-28846, G-34621, H-20158, H-23696, K-05940
GASOLINES C-30635, F-09764, G-11241
GENETICS G-26740, G-32936
GERMANY A-34754, C-28338, C-28354, F-11570, G-29276, G-32218, G-34621, H-24773, H-25826
GLADIOLI H-17710
GLANDS G-05945, G-13446, G-29276, K-07576
GLASS FABRICS C-07772, C-32718, G-06680, G-08079, K-06677
GOVERNMENTS C-28505, F-09764, L-23116, L-25288, L-29230
GRAPHITE G-06680
GREAT BRITAIN C-07772, D-29545, F-22567, G-07330, G-07423, G-08328, G-31543
GUINEA PIGS F-09764, G-09406, G-12653, G-34682

H

HALOGEN GASES A-06351, B-06883, B-30117, B-31390, B-34795, C-05191, C-09369, C-11626, C-26275, C-28126, C-28450, D-20790, D-31371, D-32912, F-09764, F-15266, G-06680, G-11241, G-28846, H-17710, H-21691, H-23696, H-25826, K-05940, K-28466
HALOGENATED HYDROCARBONS A-12422, C-09751, C-29480, C-34388, C-34432, C-34939, E-23809, F-06648, F-09764, G-06680, G-08079, G-11241, G-13154, G-31543, G-31705, H-20158, H-27872, K-06677, L-12423
HAMSTERS F-09764
HARBORS C-30635, L-23608, L-23610, L-24214
HAWAII A-33641
HEADACHE F-09764
HEALTH IMPAIRMENT A-31313, F-09764, G-05185, G-05737, G-06176, G-07234, G-07330, G-07337, G-07423, G-11241, G-31280, G-31543, G-31705, G-32936, G-33868, K-06677
HEALTH STATISTICS G-07337, G-13625, G-27085
HEART F-11570, F-13197, G-05945, G-18036, H-33046
HEAT TRANSFER A-23561, B-29328, B-32461, B-34795, G-09056, G-31624
HEMATOLOGY A-31313, C-05977, C-10392, C-29652, C-31171, C-33338, F-09764, G-06172, G-07234, G-08079, G-08746, G-09056, G-09396, G-09397, G-09524, G-10361, G-11241, G-13035, G-13154, G-18247, G-23012, G-30308, G-31624, G-32218, G-34621, H-33046, K-07576, L-25288
HEMOGLOBIN INTERACTIONS F-09764, G-32218
HEPTANES C-09751, F-06648, G-11241
HEPTENES F-09764
HERBICIDES A-31548, H-27872
HEXANES C-09751, F-06648, G-11241
HEXENES F-09764
HIGHWAYS D-31371
HORMONES G-11241, G-13446
HUMANS A-06909, A-21751, A-31313, A-34827, B-06883, C-09751, C-31171, D-26557, D-32912, F-09764, F-11570, G-05185, G-05470, G-07234, G-07319, G-07330, G-07337, G-07423, G-08079, G-08328, G-08387, G-08746, G-09396, G-11241, G-11556, G-18128, G-23012, G-26740, G-27801, G-29255, G-29276, G-30308, G-31543, G-31624, G-31705, G-32608, G-32936, G-33868, G-34621, G-34756, G-34789, K-21133, K-34664, L-29230
HUMIDITY B-06837, G-34682
HYDROCARBONS A-23561, A-30457, B-29450, C-05191, C-09333, C-09369, C-09751, C-32534, C-34388, C-34939, D-31112, F-06648, F-09764, G-05737, G-06680, G-08079, G-08746, G-11241, G-27317, G-28846, H-17710, H-20158, H-21691, H-23696, H-24773, H-25826, K-05940, K-06677, K-34100, L-23116, L-25288
HYDROCHLORIC ACID C-09587, C-28126, D-31371, H-17710, H-21691, H-25826, K-05940
HYDROCYANIC ACID C-32476, H-23696, H-25826
HYDROFLUORIC ACID A-23561, C-28126, C-32476, G-06680, G-11241, H-17710, H-20158
HYDROGEN B-30117, B-34795, G-11241
HYDROGEN SULFIDE A-12422, A-23561, A-29787, C-09369, C-26275, C-28126, C-28450, C-32476, C-32534, C-34939, D-31371, G-11241, H-17710, H-20158, H-21691, H-23696, K-28456, L-12423
HYDROLYSIS G-11241
HYDROXIDES F-06648, G-32218, H-25826, K-06677
HYPOXIA G-18128

I

ICE A-34424
ILLINOIS A-30457, D-20790
IMMUNOLOGY K-07576
IMPINGERS C-09587, C-33278, C-34815, G-08079
INCINERATION D-29490, F-09764, K-34100
INDUSTRIAL AREAS A-29787, C-07284, C-07567, D-04986, D-27188, D-31371, D-32912, G-08387, G-27085, H-23436, K-06677, K-07576, L-23608, L-23610, L-24214

INDUSTRIAL EMISSION SOURCES
A-08489, A-12422, A-14286, A-17624, A-21751, A-23561, A-27081, A-29643, A-29787, A-30292, A-31313, A-31548, A-33004, A-33058, A-34424, A-34827, B-06883, B-28918, B-29328, B-29450, B-30117, B-32461, B-34795, C-07284, C-09751, C-23771, C-28583, D-07649, D-24490, D-29545, D-31371, D-32912, F-09764, G-05185, G-05737, G-07319, G-07330, G-07337, G-07423, G-08387, G-08746, G-10361, G-26740, G-27317, G-28030, G-31280, G-32936, G-33504, G-33868, G-34756, H-23436, H-27872, H-29147, H-33046, H-34881, K-05940, K-07576, K-21133, K-34100, L-23608, L-23610, L-24214
INFANTS G-18128
INFECTIOUS DISEASES G-26740
INFRARED SPECTROMETRY C-05191, C-06045, C-09751, G-08079
INGESTION E-26697, G-29276, G-34756, H-27872
INHIBITION G-09396, G-09397, G-13035, G-21113, G-31224, H-22952
INORGANIC ACIDS A-23561, B-29328, B-29450, B-32461, C-09369, C-09587, C-23771, C-28126, C-30199, C-32476, C-34432, D-31371, F-09764, G-06680, G-11241, H-17710, H-20158, H-21691, H-25826, K-05940, K-28466, K-34100
INSTRUMENTATION A-30017, C-10392, C-26275, D-12065
INTERNAL COMBUSTION ENGINES F-09764
INTESTINES G-33504
IODIMETRIC METHODS C-09333, C-32476
IODINE C-11626, H-25826
IODINE COMPOUNDS C-05191, C-05977, C-09333, C-09587, C-28214, G-06617, G-13446, H-25826
IONIZATION C-07284
IONS C-06045, C-07284, C-30635, C-31171, C-32534, C-33277, E-26697, F-09764, F-22567, F-32072, G-11556, G-13446, G-31224, G-31624, G-32936
IRON B-29450, G-06680, G-11241, G-13446, H-23436, L-23608, L-24214
IRON COMPOUNDS A-30457, A-33004, B-29450, B-32461, C-06045, C-28126, C-28505, C-32718, D-04986, D-20790, D-31371, F-09764, G-06680, G-11241
IRON OXIDES B-29450, C-06045, G-06680

IRRADIATION CHAMBERS C-29770
ISOPENTANES F-06648
ISOTOPES C-09333, C-28338, C-29770, C-32534, C-33042, C-34641, F-10866, F-15266, F-32072, G-05470, G-06172, G-08746, G-18936, G-34789
ITALY G-34682

J

JAPAN A-29787, B-29450, C-15451, C-19506, C-28126, C-28505, C-29343, C-29480, C-29770, C-30635, C-32476, C-32534, C-32718, D-26557, D-27188, D-31371, D-32912, G-05470, G-07423, G-13154, G-17470, G-19190, G-23012, G-30308, G-32546, G-33868, H-27872, L-23116, L-23608, L-23610, L-24214, L-29230, M-23145
JET AIRCRAFT E-23744, E-28465

K

KETONES A-23561, C-09333, C-09369, C-09751, C-34939, F-06648, F-09764, G-06680, G-11241, G-27317, K-05940
KIDNEYS G-05945, G-06680, G-07234, G-07319, G-07330, G-08092, G-08746, G-11556, G-12653, G-18036, G-29276, G-33504, H-33046, K-07576
KRAFT PULPING A-12422, A-31548

L

LABORATORY ANIMALS F-09764, F-11570, F-13197, G-05945, G-06617, G-07234, G-08167, G-08746, G-09396, G-09397, G-09406, G-09524, G-10361, G-11556, G-12653, G-13446, G-18036, G-21113, G-31629, G-32546, G-34682, H-23696, H-33046, K-05940, K-21133
LABORATORY FACILITIES C-09333
LAKES A-34754, D-30511, E-26697, E-28465
LASERS C-26275
LEAD C-05977, C-06045, F-06648, F-11570, G-06680, G-07423, G-08079, G-11241, K-06677, K-07576
LEAD COMPOUNDS A-06351, A-23561, A-29787, A-31313, B-31390, C-05977, C-09333, C-11626, C-25431, C-26275, C-28126, C-28450, C-30635, C-32476, C-32534, C-32718, C-33042, C-33338, D-04986, D-07649, D-27188, D-32912, F-06648, F-11570, G-06680, G-08079, G-11241, G-13154, G-13625, G-17470, G-27085, G-27801, G-31280, G-32218, G-32608, G-34789, H-19770, K-06677, K-07576, K-28466, L-23608, L-23610, L-24214, L-25288
LEAVES D-32912, H-19770, H-20158, H-21691, H-22952, H-23696
LEGAL ASPECTS A-29787, C-28505, D-32912, L-23116, L-29230, M-23145
LEGISLATION D-32912, L-29230
LEUKOCYTES F-09764, G-27085
LIGHT RADIATION A-23561, B-29450, C-05191, E-23809, F-09764
LIMESTONE G-06680
LIPIDS F-11570, G-09396, G-34789
LIQUIDS C-09751, C-29652, C-33277, C-34641, F-06648, G-11241, G-18036, H-19770
LITHIUM COMPOUNDS A-06351, F-15266
LIVER G-05945, G-08092, G-09397, G-18036, G-29276, G-33504
LOCAL GOVERNMENTS L-23116
LONDON G-07423
LOWER ATMOSPHERE D-12065
LUBRICANTS B-29450
LUNG CANCER G-07423, G-08328, G-13625, L-25288
LUNGS G-05945, G-06680, G-08092, G-08328, G-08746, G-09406, G-12653, G-13035, G-18036, G-29276, G-31224, C-32546
LYMPHOCYTES F-09764

M

MAGNESIUM F-06648, G-11241
MAGNESIUM COMPOUNDS C-06045, D-04986, F-13197, G-06680, G-11241, G-32608, H-25927
MALES G-07234, G-08328, G-08387
MANGANESE G-06680, G-07423, G-08079, G-08328, G-11241, K-05940, K-06677
MANGANESE COMPOUNDS A-06351, B-06883, C-06045, C-28126, C-28505, C-30199, C-32718, D-04986, D-20790, D-27188, F-13197, G-06680, G-08079, G-11241, G-13625, G-17470, G-32608, K-05940, K-06677, K-28466
MARYLAND D-04986
MASS SPECTROMETRY C-26275, C-34641
MATERIALS DETERIORATION D-26557
MATHEMATICAL ANALYSES F-22567, G-08092
MATHEMATICAL MODELING G-08092
MAXIMUM ALLOWABLE CONCENTRATION A-08489, A-29643, C-34815, G-05945, G-06680, G-07337, K-05940, K-06677, K-21133, K-28466, K-34664, L-23608, L-23610, L-24214
MBTH METHOD C-32476
MEASUREMENT METHODS A-21751, C-07284, C-07567, C-07772, C-09333, C-10392, C-15451, C-19506, C-25431, C-26275, C-28126, C-28214, C-28338, C-28450, C-28583, C-29343, C-29652, C-31862, C-32534, C-34432, C-34641, D-07649, D-12065, D-31112, D-31371, D-32912, G-05945, G-06239, G-06617, G-08079, G-09056, G-13035, G-26740, G-32546, G-32608, K-05940
MEDICAL PERSONNEL C-15451, G-08079
MEETINGS E-23809
MEMBRANE FILTERS C-07772, C-32476, G-08079
MEMBRANES F-13197, G-08746, G-32218

MERCAPTANS A-12422, C-34939, D-31371, G-11241, H-25826, L-12423
MERCURY A-06909, A-08489, B-06837, B-06883, B-06884, C-05191, C-05977, C-06045, C-07284, C-07567, C-08134, C-09587, C-10392, C-15451, D-06671, D-12065, F-06648, F-10866, F-11570, F-14712, F-32072, G-05185, G-05470, G-05737, G-05945, G-06172, G-06239, G-06680, G-07319, G-07330, G-07337, G-07423, G-08079, G-08092, G-08167, G-08328, G-08387, G-08746, G-09056, G-09396, G-09397, G-09406, G-09524, G-10361, G-11241, G-11556, G-13446, H-23696, K-05940, K-06677, K-07576, K-21133
MERCURY COMPOUNDS A-06351, A-08489, A-12422, A-14286, A-17624, A-21751, A-23561, A-27081, A-29643, A-29787, A-30017, A-30292, A-30457, A-31313, A-31548, A-33004, A-33058, A-33641, A-34424, A-34754, A-34827, B-28918, B-29328, B-29450, B-30117, B-31390, B-32461, B-34795, C-05977, C-06045, C-07284, C-07567, C-07772, C-08134, C-09333, C-09369, C-09587, C-09751, C-10392, C-11626, C-19506, C-20944, C-23771, C-25431, C-26275, C-27389, C-28126, C-28214, C-28338, C-28354, C-28450, C-28505, C-28583, C-29343, C-29652, C-29770, C-30199, C-30510, C-30635, C-31171, C-31862, C-32476, C-32534, C-32718, C-33042, C-33277, C-33278, C-33338, C-33886, C-34388, C-34432, C-34641, C-34808, C-34815, C-34939, D-04986, D-06671,

D-07649, D-20790, D-26557, D-27188, D-29490, D-29545, D-30511, D-31112, D-31371, D-32912, E-23744, E-23809, E-26697, E-28465, F-06648, F-09764, F-10866, F-11570, F-13197, F-13348, F-15266, F-22567, F-32072, G-05185, G-05470, G-05737, G-05945, G-06172, G-06176, G-06239, G-06617, G-06680, G-07234, G-07319, G-08079, G-08092, G-08167, G-08387, G-08746, G-09056, G-09396, G-09397, G-09406, G-09524, G-10361, G-11241, G-11556, G-12653, G-13035, G-13154, G-13625, G-17470, G-18036, G-18128, G-18247, G-19190, G-21113, G-23012, G-26740, G-27085, G-27317, G-27387, G-27801, G-28013, G-28030, G-28846, G-29255, G-29276, G-30308, G-31224, G-31280, G-31543, G-31624, G-31629, G-31705, G-32218, G-32546, G-32608, G-32936, G-33504, G-33868, G-34621, G-34682, G-34756, G-34789, H-17710, H-19770, H-20158, H-21691, H-22952, H-23436, H-24773, H-25826, H-25927, H-27872, H-28849, H-29147, H-33046, H-34881, K-05940, K-06677, K-07576, K-28466, K-34100, K-34664, L-12423, L-23116, L-23608, L-23610, L-24214, L-25288, L-29230, M-23145

METABOLISM A-29643, A-31313, G-06172, G-06680, G-08746, G-09406, G-09524, G-13154, G-21113, G-27801, G-31629, G-31705, G-33504, K-07576

METAL COMPOUNDS A-06351, A-08489, A-12422, A-14286, A-17624, A-21751, A-23561, A-27081, A-29643, A-29787, A-30017, A-30292, A-30457, A-31313, A-31548, A-33004, A-33058, A-33641, A-34424, A-34754, A-34827, B-06883, B-28918, B-29328, B-29450, B-30117, B-31390, B-32461, B-34795, C-05977, C-06045, C-07284, C-07567, C-07772, C-08134, C-09333, C-09369, C-09587, C-09751, C-10392, C-11626, C-19506, C-20944, C-23771, C-25431, C-26275, C-27389, C-28126, C-28214, C-28338, C-28354, C-28450, C-28505, C-28583, C-29343, C-29652, C-29770, C-30199, C-30510, C-30635, C-31171, C-31862, C-32476, C-32534, C-32718, C-33042, C-33277, C-33278, C-33338, C-33886, C-34388, C-34432, C-34641, C-34808, C-34815, C-34939, D-04986, D-06671, D-07649, D-20790, D-26557, D-27188, D-29490, D-29545, D-30511, D-31112, D-31371, D-32912, E-23744, E-23809, E-26697, E-28465, F-06648, F-09764, F-10866, F-11570, F-13197, F-13348, F-15266, F-22567, F-32072, G-05185, G-05470, G-05737, G-05945, G-06172, G-06176, G-06239, G-06617, G-06680, G-07234, G-07319, G-08079, G-08092, G-08167, G-08328, G-08387, G-08746, G-09056, G-09396, G-09397, G-09406, G-09524, G-10361, G-11241, G-11556, G-12653, G-13035, G-13154, G-13625, G-17470, G-18036, G-18128, G-18247, G-19190, G-21113, G-23012, G-26740, G-27085, G-27317, G-27387, G-27801, G-28013, G-28030, G-28846, G-29255, G-29276, G-30308, G-31224, G-31280, G-31543, G-31624, G-31629, G-31705, G-32218, G-32546, G-32608, G-32936, G-33504, G-33868, G-34621, G-34682, G-34756, G-34789, H-17710, H-19770, H-20158, H-21691, H-22952, H-23436, H-24773, H-25826, H-25927, H-27872, H-28849, H-29147, H-33046, H-34881, K-05940, K-06677, K-07576, K-28466, K-34100, K-34664, L-12423, L-23116, L-23608, L-23610, L-24214, L-25288, L-29230, M-23145

METAL FABRICATING AND FINISHING A-21751, G-08387, G-10361

METAL POISONING A-21751, A-29643, A-31313, B-28918, C-15451, C-33338, F-11570, G-05185, G-05470, G-05737, G-05945, G-06172, G-06176, G-07234, G-07319, G-07330, G-07337, G-08167, G-08746, G-09396, G-09397, G-09406, G-09524, G-11556, G-13625, G-17470, G-18128, G-19190, G-21113, G-23012, G-27085, G-29276, G-31280, G-31543, G-31705, G-32218, G-32546, G-32608, G-32936, G-33868, G-34756, K-21133, M-23145

METALS A-06909, A-08489, A-29787, B-06837, B-06883, B-06884, B-29328, B-29450, C-05191, C-05977, C-06045, C-07284, C-07567, C-08134, C-09587, C-10392, C-15451, D-06671, D-12065, F-06648, F-09764, F-10866, F-11570, F-14712, F-32072, G-05185, G-05470, G-05737, G-05945, G-06172, G-06239, G-06680, G-07234, G-07319, G-07330, G-07337, G-07423, G-08079, G-08092, G-08167, G-08328, G-08387, G-08746, G-09056, G-09396, G-09397, G-09406, G-09524, G-10361, G-11241, G-11556, G-13446, H-23436, H-23696, K-05940, K-06677, K-07576, K-21133, L-23608, L-24214

METEOROLOGY A-23561, A-27081, A-29787, A-30292, A-34424, A-34754, B-06837, C-09369, C-33042, D-06671, D-12065, D-31371, D-32912, E-23744, E-23809, E-26697, G-34682, H-25826, H-28849, K-34664, L-25288

METHANES C-09751, F-06648, G-11241

MEUSE VALLEY G-07423

MICE F-09764, G-08167, G-10361, G-11556, G-13446, G-31629

MICROMETEOROLOGY A-23561, E-23809, L-25288

MICROORGANISMS A-29643, B-29450, C-34388, F-09764, G-11241, G-31543

MIDDLE ATMOSPHERE E-23744, E-23809

MILK G-32936, H-33046

MINERAL PROCESSING A-21751, A-27081, A-33058, A-34424, B-06883, C-28583, G-05737, G-08387, G-10361, G-33504, H-29147, H-33046, K-34100

MINERAL PRODUCTS A-23561, A-34754, C-06045, G-05737, G-06680, G-07423, G-13625, G-27085, K-06677, K-34100, K-34664

MINING A-21751, A-27081, C-28583, G-05737, G-08387, G-33504, H-29147, H-33046

MISTS C-09333, C-09587, C-23771, F-09764, G-07234

MOBILE C-25431

MOLYBDENUM F-09764, G-06680, G-11241, K-06677

MOLYBDENUM COMPOUNDS A-06351, G-06680, G-11241, G-32608, K-06677

MONITORING A-21751, C-15451, C-25431, C-26275, C-29343, C-32534, D-07649, D-12065, G-32546, G-32608

MONTHLY K-34664

MORBIDITY G-08387

MORTALITY A-31313, G-08167, G-19190, G-31705

MOTTLING H-21691

MOUTH G-07330

MULTIPLE CHAMBER INCINERATORS F-09764

MUTATIONS A-29643, G-26740

N

NAPHTHALENES F-06648

NATURAL GAS F-09764

NECROSIS F-09764, H-21691

NERVOUS SYSTEM A-31313, G-05185, G-05945, G-07337, G-08092, G-08167, G-08746, G-09397, G-09406, G-11241, G-11556, G-17470, G-18036, G-29255, G-31543, H-33046, K-21133

NEUTRON ACTIVATION ANALYSIS A-30457, A-33004, A-34424, C-11626, C-29770, C-30510, C-31171, C-33042, D-20790, F-32072, G-05470, G-08328, G-09056, G-31624, H-33046, H-34881

NEW YORK CITY G-07423

NEW YORK STATE G-07423

NICKEL F-09764, G-08079, G-11241, G-13446, K-06677

NICKEL COMPOUNDS A-06351, A-12422, C-09369, D-27188, F-13197, G-06680, G-08079, G-11241, G-31280, K-06677, L-12423

NITRATES A-23561, C-09369, C-23771, F-09764, G-27317, G-32218

NITRIC ACID C-23771, C-34432, G-06680, K-34100

NITRIC OXIDE (NO) A-23561, C-09369, C-29480, C-32534, F-09764, G-11241

NITRITES G-06617

NITROGEN G-11241

NITROGEN DIOXIDE (NO2) A-23561, C-09333, C-09369, C-28126, C-29480, C-32534, D-32912, F-09764, G-06680, G-11241, G-31705, K-34100

NITROGEN OXIDES A-23561, C-09333, C-09369, C-28126, C-29480, C-32476, C-32534, D-04986, D-26557, D-31371, D-32912, F-06648, F-09764, G-06680, G-08079, G-11241, G-27317, G-27801, G-31705, H-17710, K-28466, K-34100, L-23116, L-25288

NITROGEN TRIOXIDE (NO3) C-32534

NITROUS ACID F-09764

NITROUS OXIDE (N2O) G-11241

NON-INDUSTRIAL EMISSION SOURCES A-23561, A-31548, A-34827, B-30117, B-34795, C-29343, C-30635, C-33042, D-26557, D-31371, E-23744, E-23809, E-26697, E-28465, F-09764, G-23012, G-27801, G-28030, G-31705, G-32936, H-29147, H-33046, H-34881, L-23116, L-23608, L-23610, L-24214

NON-URBAN AREAS D-04986, F-09764, G-31543

O

OCCUPATIONAL HEALTH A-08489, A-31313, B-28918, C-15451, C-27389, C-28583, C-34815, D-06671, D-31112, G-05470, G-05737, G-06176, G-06680, G-07319, G-07330, G-07337, G-08079, G-08387, G-08746, G-10361, G-13154, G-23012, G-27085, G-27317, G-28846, G-32608, G-33504, G-34621, G-34682, G-34756, K-06677, K-07576, K-21133

OCEANS A-27081, A-30292, C-33042, E-23744, E-28465
OCTANES F-06648
ODORIMETRY D-31371, K-05940
ODORS D-31371, G-11241, K-05940, L-23608, L-23610
OHIO D-04986
OLEFINS C-09751, C-34939, F-06648, F-09764, G-11241, H-17710, H-20158, H-21691, H-23696, H-24773, H-25826
OPEN BURNING F-09764
OPERATING VARIABLES B-34795
ORGANIC ACIDS C-32476, D-31371, F-06648, F-09764, G-06617, G-08079, G-11241, H-23696, H-25826, K-06677
ORGANIC DISEASES G-05945
ORGANIC NITROGEN COMPOUNDS B-06837, C-32534, C-34939, F-06648, F-09764, G-05737, G-06239, G-11241, G-26740, G-27317, K-06677
ORGANIC PHOSPHORUS COMPOUNDS C-34939, H-27872, K-06677, K-07576, L-23608, L-23610, L-24214
ORGANIC SULFUR COMPOUNDS A-12422, A-29643, C-34939, D-31371, F-13348, G-06239, G-06617, G-09524, G-11241, G-32936, H-25826, K-06677, L-12423
ORGANOMETALLICS A-31548, A-34827, B-31390, C-07772, C-30510, C-33278, D-06671, D-26557, D-30511, G-23012, G-30308, G-31543, K-06677, L-23608, L-23610, L-24214, L-29230
ORSAT ANALYSIS G-08079
OUTPATIENT VISITS G-05185
OXIDANTS C-26275, C-32476, C-32534, D-26557, F-09764, K-34100, L-23116, L-25288
OXIDATION E-26697, G-08746, G-11241, G-11556, G-18247
OXIDES A-06351, A-12422, A-23561, A-29787, B-06883, B-29450, C-05191, C-06045, C-09333, C-09369, C-09751, C-28126, C-28450, C-29343, C-29480, C-32476, C-32534, D-04986, D-26557, D-31371, D-32912, E-23744, E-23809, E-28465, F-06648, F-09764, G-06680, G-07423, G-08079, G-11241, G-13154, G-13625, G-27085, G-27317, G-27801, G-28846, G-31705, G-34621, G-34682, H-17710, H-19770, H-20158, H-21691, H-23696, H-24773, H-25826, H-25927, K-05940, K-06677, K-28466, K-34100, L-12423, L-23116, L-23608, L-23610, L-24214, L-25288, M-23145
OXYGEN B-31390, C-28354, F-09764, G-11241, H-24773
OXYGEN CONSUMPTION D-31371, G-31224
OZONE A-23561, B-31390, C-09333, C-09369, C-28126, C-32476, C-34388, F-09764, G-06680, G-11241

P

PACKED TOWERS B-29328, B-32461
PAINT MANUFACTURING A-31313, G-33504
PAINTS A-31313, C-09751
PAPER CHROMATOGRAPHY A-30292, C-33886, F-32072
PAPER MANUFACTURING A-12422, A-31548, B-29450
PARTICLE COUNTERS C-26275
PARTICLE SIZE A-23561, A-33641, C-23771, C-26275, C-29343
PARTICULATE CLASSIFIERS A-23561, A-33641, C-23771, C-26275, C-29343
PARTICULATE SAMPLING C-08134, C-09333, C-23771, D-20790, G-06239, G-08079
PARTICULATES A-23561, A-29787, A-30292, A-33641, B-06883, B-06884, B-29328, B-32461, C-05977, C-07772, C-08134, C-09333, C-09587, C-23771, C-25431, C-26275, C-29343, C-32534, C-32718, C-33042, C-34815, D-04986, D-12065, D-20790, D-26557, D-29545, D-30511, D-31112, D-31371, D-32912, E-23744, E-23809, E-28465, F-09764, G-06680, G-07234, G-07319, G-07330, G-08079, G-08328, G-08387, G-09396, G-11241, G-28030, G-31705, H-17710, H-25826, K-05940, K-06677, K-28466, K-34100, L-23116, L-23608, L-23610, L-24214, L-25288, M-23145
PATHOLOGICAL TECHNIQUES F-11570, G-05945, G-07234, G-08092, K-07576
PENNSYLVANIA D-04986, G-07423
PENTANES C-09751, F-06648
PERMITS L-25288
PEROXIDES C-09369
PEROXYACETYL NITRATE A-23561, F-09764
PEROXYACYL NITRATES A-23561, F-09764
PERSONNEL C-15451, G-08079
PESTICIDES A-23561, A-30292, D-06671, E-23744, E-23809, E-28465, G-05737, G-07423, G-08167, G-11556, G-26740, G-27801, G-31543, G-31705, H-17710, H-27872
PETROLEUM REFINING D-31371
PETUNIAS H-22952
PH C-09333, C-27389
PHENOLS C-34388, F-06648, K-28466
PHENYL COMPOUNDS C-32534, C-34939, F-09764, G-08746, K-05940
PHENYLS C-32534, C-34939
PHOSPHATES C-23771, G-06680, G-08167, G-32218
PHOSPHINE C-09369, G-06680
PHOSPHORESCENCE C-34939
PHOSPHORIC ACID C-23771
PHOSPHORUS COMPOUNDS A-06351, C-09369, C-23771, F-06648, G-06680, G-08167, G-32218, K-28466
PHOTOCHEMICAL REACTIONS A-23561, F-15266, K-34100
PHOTOELECTRIC PHENOMENA C-25431
PHOTOGRAPHIC METHODS C-25431, G-28013
PHOTOMETRIC METHODS C-09333, C-15451, C-19506, C-26275, C-28126, C-28583, C-29652, C-31862, C-32534, C-34641, G-09056, G-13035, K-05940
PHOTOSYNTHESIS G-27801, H-21691
PHTHALIC ACID F-06648
PHYSICAL STATES A-08489, A-17624, A-33641, A-34424, B-06837, B-06883, B-06884, B-31390, C-05977, C-07284, C-07567, C-07772, C-09333, C-09751, C-10392, C-15451, C-20944, C-28214, C-28583, C-29652, C-31862, C-33277, C-33886, C-34641, C-34815, D-12065, D-29490, D-29545, D-30511, F-06648, F-09764, F-14712, G-05470, G-05945, G-07234, G-08079, G-08092, G-08167, G-08746, G-09056, G-09396, G-09397, G-09524, G-11241, G-18036, G-18128, G-18247, G-21113, G-28846, G-31629, G-34621, H-19770, H-20158, H-22952, H-23696, H-25826, H-28849, K-05940, K-07576, K-21133
PHYTOTOXICANTS A-31548, H-23696, H-27872
PLANS AND PROGRAMS A-31313, B-34795, D-29490, D-31371, L-12423, L-23608, L-23610, L-24214, L-25288, M-23145
PLANT DAMAGE D-26557, F-09764, G-27801, H-17710, H-19770, H-20158, H-21691, H-22952, H-23696, H-25826, H-25927, H-28849, L-25288
PLANT GROWTH G-27801, H-21691, H-24773
PLANT INDICATORS H-23436, H-25927
PLANTS (BOTANY) A-29787, A-34754, A-34827, C-33042, D-32912, E-23744, F-09764, G-29255, G-32936, H-17710, H-19770, H-20158, H-21691, H-22952, H-23436, H-23696, H-24773, H-28849, H-29147, K-06677
PLASTICS C-09587, C-09751, G-11241, K-06677
PNEUMOCONIOSIS G-08387, G-13625, G-27085, G-32608
PNEUMONIA G-18128
POLAROGRAPHIC METHODS C-05977, C-32534, F-13348
POLLENS F-09764
POLYMERIZATION B-29450
POLYNUCLEAR COMPOUNDS C-34939, F-06648
PORTABLE C-23771, C-30199
POTASSIUM COMPOUNDS C-30199, D-04986, F-06648
POULTRY F-09764, G-32936, H-33046
POWER SOURCES F-09764
PRECIPITATION A-34424, A-34754, C-09369, C-33042, E-26697
PRESSURE C-09751, F-09764, F-22567
PRESSURE (ATMOSPHERIC) A-27081
PRIMARY METALLURGICAL PROCESSING A-29787, A-34424, A-34827, B-29328, B-29450, B-32461, C-28583, G-10361, H-23436, L-23610, L-24214
PRIMATES F-09764, G-18036
PRINTING G-26740
PROCESS MODIFICATION B-30117
PROPIONALDEHYDES G-11241
PROTEINS F-11570, F-13348, G-09524, G-32218, G-32936, G-34789, K-07576
PUBLIC AFFAIRS L-29230
PUBLIC INFORMATION L-29230
PULMONARY FUNCTION F-09764, G-18128, G-30308
PULMONARY RESISTANCE F-09764
PYRENES C-34939

Q

QUARTZ G-06680, K-06677
QUINOLINES F-06648
QUINONES C-34939, F-06648

R

RABBITS F-09764, G-07234, G-08746, G-09396, G-09397, G-09524, G-10361, G-18036, H-33046
RADIATION COUNTERS G-09056
RADIATION MEASURING SYSTEMS C-25431, C-28338, G-09056

RADIOACTIVE RADIATION C-09333, C-11626, C-28338, C-29770, C-32534, C-33042, F-10866, F-32072, G-05470, G-08746, G-09056, G-09406, G-12653, G-13446, G-26740, G-27801, H-27872
RADIOACTIVE TRACERS C-28338, C-29770, F-10866, F-32072, G-08746, G-09406, G-12653, G-13446
RADIOGRAPHY C-32718, G-09406, G-18036, G-30308
RADON C-09369
RAIN A-34754, C-33042, E-26697
RATS F-09764, G-05945, G-11556, G-18036, G-21113, G-32546, K-21133
REACTION KINETICS C-09587, C-29480, F-32072, G-11241
REACTION MECHANISMS A-29643, E-26697, F-13348, F-22567, G-07319, G-08328, G-18247, G-31629, G-32936
RECORDING METHODS C-10392, C-25431, F-11570, G-28013
REDUCTION C-29652, C-31862, G-08746, G-11241, G-11556, G-31629
REFRACTORIES G-08079
REGIONAL GOVERNMENTS C-28505, F-09764
REGULATIONS A-29787, C-28505, L-29230
RENDERING A-31548
REPRODUCTION G-31705, G-33868
RESEARCH INSTITUTES B-34795, E-28465
RESEARCH METHODOLOGIES C-33042, C-34815, G-07337
RESEARCH PROGRAMS C-29343, E-23809, E-28465, H-25927
RESIDENTIAL AREAS B-06883, B-06884, D 04986, D-27188, D-31371
RESIDUAL OILS B-29450, C-32718
RESPIRATION H-23696, H-24773
RESPIRATORY DISEASES F-09764, G-05737, G-07423, G-08387, G-13625, G-18128, G-27085, G-30308, G-32608, L-25288, L-29230
RESPIRATORY FUNCTIONS A-34424, C-09333, D-31371, F-09764, G-08328, G-09406, G-12653, G-13035, G-13625, G-18128, G-30308, G-31224, G-34621, G-34682
RESPIRATORY SYSTEM G-05945, G-06680, G-08092, G-08167, G-08328, G-08746, G-09406, G-12653, G-13035, G-18036, G-29276, G-31224, G-32546
RETENTION F-09764, G-09406, G-13035, G-29276, G-31629, G-32546, G-34621, H-27872, H-29147
RIVERS C-33042, E-28465, G-23012, L-23608, L-23610, L-24214
RUBBER MANUFACTURING G-05737

S

SAFETY EQUIPMENT D-06671, G-34756
SALTZMAN METHOD C-29480, C-32476
SAMPLERS C-07772, C-08134, C-09587, C-23771, C-26275, C-28450, C-32476, C-33278, C-34815, D-20790, D-29545, G-08079
SAMPLING METHODS A-33641, C-05977, C-07567, C-07772, C-08134, C-09333, C-09587, C-23771, C-26275, C-27389, C-28126, C-28214, C-28450, C-32476, C-32534, C-32718, C-33278, C-34641, C-34815, D-04986, D-20790, D-29545, D-31112, D-32912, G-06239, G-08079, G-28030
SAMPLING PROBES C-34641
SAN FRANCISCO D-12065
SCRUBBERS A-21751, B-06883, B-29328, B-32461, C-34432
SEASONAL A-27081, D-04986, D-12065, D-31371
SELENIUM COMPOUNDS A-33004, B-29328, B-32461, C-28354, C-33886, G-06680, G-08079, G-31629, G-32608, H-25826
SETTLING CHAMBERS A-31548
SETTLING PARTICLES A-29787, B-06883, B-29328, B-32461, C-05977, C-07772, C-09587, C-23771, C-25431, C-29343, C-32534, C-32718, C-34815, D-04986, D-12065, D-26557, D-29545, D-32912, F-09764, G-06680, G-07319, G-08079, G-08328, G-08387, G-11241, G-28030, K-06677, K-28466, M-23145
SEWAGE B-30117, C-30635
SILICATES C-06045, G-06680
SILICON COMPOUNDS C-06045, F-06648, F-09764, G-06680
SILICON DIOXIDE C-09333, K-06677
SILICOSIS G-08387, G-27085, G-32608
SILVER COMPOUNDS A-06351, C-33042, D-04986, D-20790, F-22567, G-11241
SINGLE CHAMBER INCINERATORS F-09764
SKIN G-07234, G-11241, G-18036, G-23012
SKIN CANCER F-09764
SLUDGE C-30635
SMOG A-30292, D-12065, F-09764, G-31705, H-17710
SMOKEMETERS C-26275, C-32534
SMOKES A-29787, F-09764, G-11241, H-25826
SMOKING F-09764, G-13625
SNOW C-33042
SOAP MANUFACTURING C-09751
SOCIAL ATTITUDES E-28465, G-19190
SOCIO-ECONOMIC FACTORS A-33058, A-34827, K-34664, M-23145
SODIUM CHLORIDE A-08489, F-06648
SODIUM COMPOUNDS A-08489, A-33004, B-30117, C-09333, D-04986, D-20790, F-06648, F-22567, G-06617, G-06680, G-11241, G-31629
SODIUM HYDROXIDE B-30117, F-06648, G-06680
SODIUM SULFITE G-31629
SOILS A-29787, A-33058, A-34754, D-30511, D-31371, E-26697, H-28849
SOLAR RADIATION A-23561, E-23809
SOLID WASTE DISPOSAL A-31548, B-30117, B-34795, F-09764
SOLIDS A-34424
SOLVENTS C-09333, G-08079, G-17470, G-27085, G-34621
SOOT D-26557, K-28466
SOOT FALL D-26557
SO2 REMOVAL (COMBUSTION PRODUCTS) B-06883
SPACECRAFT ATMOSPHERES C-05191, C-09751, G-11241
SPARK IGNITION ENGINES F-09764
SPECTROMETRY A-06351, C-05191, C-06045, C-09751, C-25431, C-26275, C-29480, C-30510, C-30635, C-32476, C-32534, C-32718, C-33042, C-34388, C-34432, C-34641, D-07649, D-20790, D-29490, D-31112, G-05470, G-08079
SPECTROPHOTOMETRY A-33058, A-33641, C-05191, C-05977, C-06045, C-07567, C-09333, C-09751, C-10392, C-19506, C-27389, C-28126, C-28505, C-30510, C-31862, C-33277, C-33338, C-34388, C-34808, C-34939, D-07649, D-32912, F-15266, G-06239, G-09056, G-27387, G-28013
SPORES F-09764
SPOT TESTS C-05977, C-07772
STABILITY (ATMOSPHERIC) K-34664
STACK GASES A-29787, B-32461, D-29490, D-32912, H-33046
STANDARDS A-08489, A-29643, A-34827, B-30117, C-34815, D-30511, G-05945, G-06680, G-07337, G-11241, G-31280, K-05940, K-06677, K-21133, K-28466, K-34100, K-34664, L-23116, L-23608, L-23610, L-24214, L-25288, M-23145
STATISTICAL ANALYSES A-14286, G-07234, G-07423, G-08746
STEAM PLANTS A-33004, B-29450, D-29490, K-34100
STEEL G-06680, H-23436, L-23608, L-24214
STILBENE F-09764
STIPPLING H-21691
STOMACH G-05945
STREETS D-04986, H-23436
STRONTIUM COMPOUNDS A-06351, C-09333, F-13197, G-31224
SUBLIMATION F-32072
SULFATES B-29328, B-29450, C-09369, D-04986, G-32218
SULFHYDRYL COMPOUNDS A-29643, F-13348, G-06617, G-09524, G-32936
SULFIDES A-12422, A-23561, A-29787, A-30457, A-34424, B-29328, B-30117, C-06045, C-09369, C-26275, C-28126, C-28450, C-32476, C-32534, C-34939, D-12065, D-31371, E-26697, F-06648, F-22567, G-06680, G-08079, G-11241, G-28846, H-17710, H-20158, H-21691, H-23696, K-05940, K-28466, L-12423
SULFITES B-29450
SULFUR COMPOUNDS A-12422, A-23561, A-29787, A-30457, A-34424, B-06837, B-29328, B-29450, B-30117, C-06045, C-09369, C-26275, C-28126, C-28450, C-32476, C-32534, C-32718, C-34939, D-04986, D-12065, D-31371, E-26697, F-06648, F-22567, G-06680, G-08079, G-11241, G-28846, G-32218, H-17710, H-19770, H-20158, H-21691, H-22952, H-23696, K-05940, K-28466, L-12423
SULFUR DIOXIDE A-12422, A-23561, A-29787, B-29450, C-05191, C-09333, C-09369, C-28126, C-28450, C-29343, C-32476, D-04986, D-31371, D-32912, E-23809, F-09764, G-06680, G-07423, G-11241, G-13625, G-31705, H-17710, H-20158, H-23696, H-25927, K-28466, K-34100, L-12423, L-23610, L-24214, L-25288, M-23145
SULFUR OXIDES A-12422, A-23561, A-29787, B-29450, C-05191, C-09333, C-09369, C-28126, C-28450, C-29343, C-32476, D-04986, D-26557, D-31371, D-32912, E-23809, F-09764, G-06680, G-07423, G-11241, G-13625, G-27801, G-31705, H-17710, H-20158, H-23696, H-25927, K-28466, K-34100, L-12423, L-23608, L-23610, L-24214, L-25288, M-23145
SULFUR OXIDES CONTROL B-06883, B-29450, D-32912
SULFUR TRIOXIDE C-09369, D-32912, F-09764, G-06680

SULFURIC ACID B-29328, B-29450, B-32461, C-09369, C-23771, C-30199, F-09764, G-11241, H-25826, K-28466, K-34100
SURFACE COATINGS A-31313, C-09751
SURFACE PROPERTIES B-31390, G-06617
SUSPENDED PARTICULATES A-23561, A-29787, A-30292, C-05977, C-07772, C-09333, C-09587, C-23771, D-04986, D-12065, D-31371, F-09764, G-07234, G-07319, G-07330, G-08079, G-11241, G-31705, H-17710, H-25826, L-23116, L-23608, L-23610, L-24214
SWEDEN C-11626, C-30199, C-30510, G-09406, G-31624, G-33868, H-23436, H-34881
SYNERGISM G-10361, G-11241, G-27801, G-31280, G-31705
SYNTHETIC FIBERS A-08489

T

TAR H-25826
TEFLON C-09587, C-09751
TEMPERATURE A-08489, B-32461, B-34795, C-29480, C-30635, C-33886, F-06648, F-09764, F-32072, G-10361, G-31624
TEMPERATURE (ATMOSPHERIC) A-27081, D-06671, D-12065, E-23744, E-23809, E-26697, H-28849
TEMPERATURE SENSING INSTRUMENTS A-17624
TENSILE STRENGTH F-06648
TESTING FACILITIES C-09333, C-29770, G-07234, G-08092, G-08167, G-12653
TETRAETHYL LEAD B-31390, C-05977, D-07649, G-08079
TEXTILE MANUFACTURING A-08489, G-28030
TEXTILES A-08489, A-30292, G-33504, K-06677
THERMAL RADIATION B-32461
THERMOMETERS A-17624
THIN-LAYER CHROMATOGRAPHY G-08079
THRESHOLDS B-34795, D-31112, G-06239, G-06680, G-08079, G-21113, G-34756, H-21691, K-05940
TIN F-06648
TIN COMPOUNDS A-06351, B-31390, C-29652, D-04986, D-27188, F-09764, G-17470, G-31280
TIP BURN H-21691
TIRES G-05737
TISSUES C-31171, C-33042, C-33338, G-08328, G-08746, G-09406, G-12653, G-29276, G-32546, G-34621
TITANIUM G-06680, K-06677
TITANIUM COMPOUNDS A-06351, B-29450, D-04986, D-27188, F-09764, G-06680
TOBACCO C-33042, K-06677
TOKYO D-32912, L-23610
TOLUENES C-09333, C-09751, F-09764, G-05737, G-08079, G-11241, G-27317
TOPOGRAPHIC INTERACTIONS A-23561, D-31371, E-23809
TOXIC TOLERANCES A-34827, G-06680, G-07234, G-07319, G-08092, G-08746, G-11241, G-28846, G-32608, G-33504, H-21691, H-25826, H-33046, K-06677
TOXICITY A-12422, A-29643, A-34827, B-06884, C-33042, E-23744, E-28465, F-32072, G-05185, G-05737, G-05945, G-06172, G-06239, G-06617, G-07234, G-07319, G-07330, G-07337, G-08167, G-08746, G-11241, G-11556, G-13154, G-18128, G-21113, G-23012, G-27085, G-27317, G-27801, G-29255, G-29276, G-31224, G-31280, G-31543, G-31705, G-32218, G-32608, G-34682, G-34789, H-23696, H-27872, K-05940, K-07576, K-21133, K-34664
TRACE ANALYSIS A-33004, A-33058, A-34754, C-05977, C-07567, C-28338, C-28354, C-28450, C-29770, C-31171, C-32534, C-33042, C-33338, C-34388, D-07649, G-08328
TRANSMISSOMETERS C-32534
TRANSPORT A-23561, A-34424, E-26697, G-32936
TRANSPORTATION A-23561, A-31313, C-05191, D-04986, D-26557, D-27188, D-32912, E-23744, E-28465, F-09764, G-11241, K-34100, L-23608, L-23610, L-24214, L-25288
TRAPPING (SAMPLING) C-32476, C-32718, D-31112, G-08079
TREATMENT AND AIDS B-28918, C-15451, C-32718, C-33042, C-34388, F-11570, G-05945, G-07330, G-08079, G-08328, G-08746, G-09406, G-11556, G-13154, G-17470, G-18036, G-18128, G-27085, G-28846, G-29255, G-30308, G-32608, G-34621, H-25826, H-33046, K-05940, L-29230
TREES D-32912, H-17710, H-21691
TUBERCULOSIS G-08387
TUMORS G-08328
TURBIDIMETRY C-28450, C-32534

U

ULTRAVIOLET RADIATION F-09764
ULTRAVIOLET SPECTROMETRY C-05191, C-32534, D-31112, G-08079
UNITED STATES A-06351
URANIUM COMPOUNDS A-06351, C-09333, F-15266, G-06680, G-08079, G-32608, K-06677
URBAN AREAS A-29787, A-30292, B-06883, B-06884, C-07284, C-07567, D-04986, D-20790, D-26557, D-27188, D-31371, D-32912, F-09764, G-08387, G-13625, G-27085, H-23436, K-06677, K-07576, L-23608, L-23610, L-24214
URINALYSIS A-31313, B-28918, C-05977, C-09333, C-10392, C-29652, C-31171, C-31862, C-33338, C-34641, G-06172, G-06176, G-06680, G-07234, G-07319, G-07330, G-07337, G-08079, G-08746, G-09396, G-09397, G-13154, G-23012, G-27387, G-28013, G-28030, G-30308, G-33868, G-34621
USSR A-06909, A-08489, A-14286, A-17624, B-06883, B-06884, B-31390, C-07284, C-07567, C-08134, C-20944, C-28450, C-34939, D-06671, F-06648, F-10866, G-05185, G-05945, G-08167, G-08387, G-09524, G-10361, G-29255, K-05940, K-06677, K-07576, K-21133, K-28466

V

VANADIUM F-09764, G-06680, G-08079
VANADIUM COMPOUNDS A-06351, A-12422, D-04986, D-20790, D-27188, G-06680, G-08079, G-32608, K-06677, L-12423
VAPOR PRESSURE C-07284, E-26697, F-06648, F-32072, G-07330, H-23696, H-28849
VAPORS A-08489, A-17624, B-06883, B-06884, B-31390, C-05977, C-07284, C-07567, C-07772, C-09333, C-10392, C-15451, C-20944, C-28214, C-28583, C-31862, C-33886, C-34815, D-12065, D-29490, D-29545, D-30511, F-14712, G-05470, G-05945, G-07234, G-08079, G-08092, G-08167, G-08746, G-09056, G-09396, G-09397, G-09524, G-18036, G-18128, G-18247, G-21113, G-28846, H-22952, H-25826, H-28849, K-05940, K-07576, K-21133
VEGETABLES A-34754, G-32936, H-21691, H-24773
VEHICLES A-23561, A-31313, D-26557, D-27188, D-32912, F-09764, G-11241, K-34100, L-23608, L-23610, L-24214, L-25288
VENTILATION B-06883, B-06884, B-28918, D-29545, G-07319, G-07337, G-08079, G-34756
VENTURI SCRUBBERS B-29328
VIRUSES C-34388, G-11241
VISIBILITY D-26557
VOLATILITY B-06884, C-07284, C-30635, E-26697, G-08746, G-31624
VOLCANOES A-33641

W

WATER C-09751, C-29652, C-33277, C-34641, F-06648, G-11241, H-19770
WATER POLLUTION A-31548, A-34827, C-29343, C-30635, C-33042, D-26557, D-31371, E-23744, E-23809, E-26697, E-28465, G-23012, G-28030, G-31705, H-29147, H-33046, H-34881, L-23116, L-23608, L-23610, L-24214
WEATHER MODIFICATION E-23744, E-23809
WEST AND GAEKE METHOD C-32476
WEST VIRGINIA D-04986
WHEAT H-17710, H-20158
WINDS A-29787, A-30292, D-06671, D-12065, D-31371, K-34664
WOOD K-06677

X

X-RAYS C-32534, G-05470, G-26740
XYLENES C-09751, F-09764, G-11241

Y

YOKOHAMA D-32912, G-07423

Z

ZINC A-29787, B-29328, C-06045, F-06648, F-09764, G-06680, G-08328, G-13446, K-06677
ZINC COMPOUNDS A-06351, A-29787, B-32461, C-09333, C-28126, C-28354, C-28505, C-30635, C-32476, C-32718, D-04986, D-20790, D-27188, F-13197, G-06680, G-11241, G-31224, G-32218, K-06677
ZIRCONIUM G-13446, K-06677

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